REPORT RESUMES

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AN ANALYSIS OF CLASSROOM ACTIVITIES, A FINAL REPORT.
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THIS REPORT OF A THREE-YEAR RESEARCH PROGRAM ON PUBLIC SCHOOL CLASSROOM ACTIVITIES CONSIDERS THE CLASSROOM TO BE AN INTEGRATED SOCIAL SYSTEM. ITS CONCERNS ARE WITH EDUCATIONAL PROCESSES THAT MAY BE OBSERVED IN THE CLASSROOM, WITH THE CONCEPTUALIZATION OF CLASSROOM EVENTS, WITH THEORY ABOUT THOSE EVENTS, AND WITH DATA BEARING ON THAT THEORY. EMPIRICAL INVESTIGATION IS BASED ON VIDEOTAPE RECORDINGS OF LIVE CLASSROOMS. OF THEORETICAL CONCERN ARE CLASSROOMS AND THEIR ACTIVITIES, AND ANALYSIS OF THOSE SOCIAL EVENTS THAT TIE TOGETHER TEACHERS, PUPILS, THEIR TASKS, AND THEIR EQUIPMENT. THIRTY-TWO SEPARATE CLASSROOMS WERE STUDIED, AND THE SIMILARITIES AND DIFFERENCES IN THEIR ACTIVITY PATTERNS ARE REPORTED. CLASSROOM EVENTS ARE FOUND TO BE DIFFERENTIALLY AFFECTED BY FOUR INDEPENDENT VARIABLES--SEX AND AGE OF TEACHER, SUBJECT MATTER, AND GRADE LEVEL. FINDINGS FOR THESE INDEPENDENT VARIABLES ARE BOTH CONTRASTED AND INTERRELATED. FINDINGS ARE ALSO PRESENTED FOR GENERAL ACTIVITY CHARACTERISTICS, COINCIDENTAL ACTIVITY PROPERTIES, AND SEQUENCES OF ACTIVITY EVENTS. (HW)

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A Final Report

Contract No. 3-20-002
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by

Bruce J. Biddle
and
Raymond S. Adams

Center for Research in Social Behavior
University of Missouri
Columbia

1967

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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PREFACE

The volume reports a three-year program of research on the activities characteristic of public school classrooms. It deals specifically with the problem involved in the conceptualizing of classroom activities, with the study of activities using video-tape for recording activities and in coding activity components for analysis. It also gives an account of a pilot study of classroom activities in which classrooms differing in grade level, subject matter, age and sex of the teacher were examined for their activity components.

Among other things, the volume is also a Final Report on a Research Contract between the Office of Education and the University of Missouri (USOE 3-20-002). This contract was, in fact, the second of a series between the Office of Education and the University of Missouri concerned with the broad subject of media impact. Both contracts attempted to answer the question; "What _other_ aspects of education -- beyond pupil achievement -- might be affected by the appearance of new educational media?" In the first contract (USOE 2-30-004) we approached this question by examining ways in which education and the institution of the school might fruitfully be conceptualized. In the present contract we have taken up the study of classroom activities as a component of classroom interaction with a view towards the measurement of media impact on activity structure in the near future.

The authors owe a debt of thanks to many others for their help in the project. Principal among them is Paul F. Green whose involvement in conceptualization, coding supervision, data analysis, and in trouble shooting while the authors were in Australia, was of inestimable value. Thomas E. Johns was primarily responsible for development of our apparatus, while Dan Kline supervised the field operations with equipment. Naomi Schwartz, Graeme Fraser, Virginia Fisher, Roger Miller, Jean Hoffman, Jerry Jellison, Richard Ingraham, and Chad Haywood. All either helped with the collection of data or coded classroom videotapes. William Bulgren served as a statistical consultant. Nancy Barron tabulated data. Portions of the manuscript were typed by many able persons, but our greatest debt is owed to Ruth Salmons, Pat Hollowell, Donna Allendorf, Sherry Watts, and Linda Lynch. Thanks are also owed to the Computer Centers of the University of Missouri and the University of Queensland where our data were processed.

A very special word of thanks goes to the cooperating teachers of St. Louis County and Jefferson City, Missouri, who, despite the apparent "big brother" aspect of the project, took the intrusion of the cameras with complete equanimity. We are also indebted to the school superintendents who so readily afforded us access to their schools and teachers.

Bruce J. Biddle
Raymond S. Adams
Columbia, Missouri
August, 1967

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CHAPTER I

THE ANALYSIS OF CLASSROOM ACTIVITIES

This report details results of a three-year program of research on the activities of public school classrooms. Its concerns are with educational processes that may be observed in the classroom, with the conceptualization of classroom events, with theory about those events, and with data bearing on that theory. Our theoretical concerns are with classrooms and their activities -- with those ubiquitous assemblies of teachers, pupils, desks, blackboards, learning and boredom with which we are all so familiar -- and with the analysis of those social events that occur tying together teachers, pupils, their tasks, and their equipment. Our report also details an empirical investigation based on videotape recordings of live classrooms. Thirty-two, separate classrooms were studied, and the similarities and differences in their activity patterns are reported here.

Theories of the Classroom

The phrase, "educational theory," has two connotations: on the one hand a set of philosophical and hortative recommendations for educational goals and procedures, on the other a set of concepts and propositions that pertain to educational events and their results which are tested empirically. Both connotations are useful. However, our concern will be with the latter meaning, which we shall refer to as "scientific" theory in education.

In this usage, there exists today no general, scientific theory of classroom behavior. Of hortative recommendations pertaining to the classroom we have an abundance. We also have today a variety of theories pertaining to the behaviors of individual teachers and pupils in the classroom. There even exist a few, relatively new theories pertaining to the behaviors of other small, face-to-face groups. But to date no investigators have stated a general set of concepts and propositions for that peculiar social phenomenon, the classroom -- and then backed up that theory with data.

Most classroom theory is, of course, hortatory. The progressive education movement, for instance, may be seen as a series of recommendations pertaining to classroom procedures. Classrooms should be conducted democratically, motivation should be intrinsic, pupils should learn at theor own rate, group discussion should be encouraged, etc. While there can be no doubt whatsoever of the revolutionary impact of these ideals on American education, it is questionable whether many of them were ever subjected to serious, empirical study. In fact, many of them simply do not apply to observable classroom processes. As observed at an early date by Waller (1932), to speak of "democracy" in education is to ignore the oligarchic character of educational procedures (and the sharp status distinction between teacher and pupils). Again, some of the most common terms used in educational parlance (for instance, "lecture" and"discussion") do not appear to distinguish among observable phenomena in actual classrooms. Indeed, many current concepts in progressive education are primarily slogans for motivating the teacher trainee rather than presumed descriptions of classroom events (viz., "teaching the whole child," or "pupil-centered education"). This is not to suggest that classroom education has not improved over the past fifty years. On the contrary, we have every faith that school children today are happier, better motivated, and achieving more than were their grandfathers in school; but the fact that our classroom procedures have improved does not mean that we have as yet studied them.

This does not mean that there are no scientific theories in education. On the contrary, the curricula of educational psychology concern themselves largely with such theories. A good deal is known today about pupil attitudes, motives, interests, sociometric preferences, learning, growth, and development. Take the field of learning theory, for instance. Not only are concepts and propositions for pupil learning extant, but there is a growing body of literature reporting the empirical testing of learning models -- particularly in the field of automated instruction. But as Gage (1963) has pointed out, theories of learning are not theories of teaching. The fact that we know how an individual pupil learns does not mean that we know the types of stimuli to which he is exposed in the classroom. Too often educational psychologists have appeared to assume a one-to-one relationship between teacher behavior (as the stimulus) and pupil response. There are at least two difficulties with this assumption. On the one hand, the classroom is a complex stimulus environment in which teacher behavior must compete for the pupil's attention with the behaviors of peers, the physical qualities of the environment, educational traditions, classroom culture, and the surrounding ecology of the school. On the other hand, unfortunately, no teacher can adequately "individualize" instruction for twenty, thirty, or more pupils. The fact is that during much of the time the classroom pupil is not being responded to directly by the teacher but is rather the passive observer of his teacher's interaction with others (see, for instance, our findings in Chapter VI).

Many of the same comments may be made of the numerous studies of teacher qualities and competence. Today there is a massive literature on the characteristics of teachers, their training, interests, attitudes, motives, and the like, and a fantastic number of studies in which relationships have been sought between these variables and various criteria for teaching effectiveness such as measures of pupil growth or ratings by teachers' superiors. However, once again, to know something about the teacher is not necessarily to know how that teacher will perform in a complex classroom situation, nor what will be the effect of his performance in interaction with other classroom factors. It is not surprising, therefore, to discover that studies in this field have been weak or inconsistent from one study to the next, and that the search for universal qualities of teacher excellence has been generally disappointing.

Somewhat different observations may be made about the related field of small group research. While it is true that investigations of group dynamics have proliferated in the past two decades, most of this activity has been empirical rather than theoretical in nature. With perhaps a half dozen exceptions stemming primarily from the influence of Lewin and balance theory, general theory in the small group field is hard to find amidst the welter of empirical results. As is suggested by McGrath and Altman (1966) the greatest contemporary need for the small group field is for overarching theories.

However, even if small group theory is granted, there are reasons for doubting whether many of the findings from small group research apply at all to the classroom. For one thing, the classroom is normally composed of an adult teacher of enormous powers and a number of physically and legally immature children. For another, the participants in the classroom are normally not there "voluntarily," nor does the classroom necessarily meet their "needs" except minimally in the sense of keeping them from the sanctions that non-attendance brings. In addition, the classroom suffers from the impositions and restrictions placed upon it by the institution and community in which it is imbedded. These facts do not necessarily mean that classrooms are different from problem-solving, recreational, or discussion groups; but findings applying to the latter should be looked at with a jaundiced eye before applying them to the classroom. For example, "leadership" within the classroom must be a quite different quality when manifested by the pupil than when exhibited by the teacher. Again, Bales' (1950) familiar interaction categories for studying small groups contrasted task-oriented behaviors with those of the social-emotional field. When one turns to the classroom one discovers a variety of group functions not recognized by Bales such as those of environmental maintenance. Protection of the physical environment would appear to be far more important in classrooms populated by children than in artifically-created or adult groups.

In summary, neither traditional educational theory, nor the fields of individual psychology as applied to pupils and teachers, nor the closely related field of small group research provides us with a general, scientific theory of classroom behavior. But what about classroom research itself; does not contemporary classroom research provide a propositional base for the further study of classroom behavior? As will be seen in Chapter II, the general asnwer to this question must be no. When the investigators first began to review the classroom research of others we had hoped to establish a compendium of findings which might form a basis for formalizing theory. Howeverr, the coverage, methods, and concepts used by various research teams were so disparate as to make assembly of their joint implications nearly impossible. This does not mean that classroom behavior is irrational. A general theory may indeed by built; pupil growth in the classroom may be understood; teacher characteristics may be related to classroom events. But we are a long way from such a general theory today, and the theoretical models suggested in this volume must be assumed to be both tenuous and subject to drastic, empirically based revision.

Classroom Activities

As will be suggested in Chapter II, there are many concepts that may be used to conceptualize and study classroom interaction. In the research reported here we have been concerned with classroom *activities* -- those joint, social events that appear within the ongoing flow of classroom events. Typical activity distinctions that might be recognized by classroom teachers include "discussion" versus "lecture," "group singing," "seat work," or "lesson summary."

As used here, the concept of activity is a relatively molar one. First of all, it is defined to be characteristic of a number of persons who are in interaction within the classroom. A "discussion," for instance, cannot be held by one person; indeed we recognize it because of joint participation within such an activity by a group of persons. Secondly, activities are molar in that they tend to persist over time and to imbed the units of interactive communication. Within a discussion, for instance, there may be a sequence of questions, declarations, hostility, support, laughter, a sneezing fit, and so on. Yet the discussion persists; we recognize its outline as a characteristic activity though a variety of distinct events in time make it up.

Classroom activities tend to be relatively unique to the classroom setting. Football games, for example, are not often found in classrooms -- nor are rodeos, family dinners, hide-and-seek games, shopping expeditions, jury trials, editorial conferences, or other recognizable activity forms. Some activity forms are occasionally found in classrooms -- debates, group recitations, "show and tell." Others occur with great frequency in nearly all classrooms -- lecturing by the teacher, the appearence of a noninvolved deviant, confusion before the lesson begins.

It would of course be possible to begin the study of classroom activities by interviewing those familiar with classroom activities -- teachers, pupils, principals -- and asking them to name typical activities and to discuss their characteristics. Such a study would produce little of significance, however, The reason for this is that we have not yet developed an adequate, empirically-based terminology with which to discuss classroom activities. Although "geography lesson" and "Algebra II-A" may be easily recognized as molar activity units by all concerned, with what vocabulary will the teacher or pupil describe the activity components within the lesson? Patently, a variety of activity components are indeed ebbing and flowing during the recognized unit. Groups of pupils (and the teacher) are forming and dissolving, there is physical motion in the classroom, various topics are taken up and disposed of, characteristic roles and transitory behavior patterns are displayed, someone tells a joke and all laugh, boredom settles in or hands are waved with energetic furver. Each of these phrases signals an activity component; and yet when we are asked to describe classroom activities as events we are often at a loss for words or tend to fall back on such vague concepts as "classroom atmosphere" or "group cohesiveness."

Instead, the investigators have adopted a different strategy. In order to investigate classroom activities we have studied intensively a group of classroom lessons that were recorded for the purpose on videotape. We chose to examine "lessons" because we generally felt that, of all types of gross activity classrooms entered into, lessons were most archtypical. Thus, the activity analysis presented here is not presumed to be characteristic of para-lecture classroom events such as transitions from one lesson to another, "show and tell" (at the elementary level), or the meeting of the German Club (at the secondary level) -- events which most assuredly also take place in class rooms and which occupy the attention of teachers and pupils.

The adoption of this strategy has also constrained the type of activity concepts we have adopted. Instead of "discovering" the vocabulary with which classroom participants discuss activities that appear in classroom lessons, we have instead had to develop our own analytic vocabulary to describe activity components. Of necessity, some -- perhaps many -- of the terms used in this vocabulary will be unfamiliar to readers;

they reflect the analytic lexicons of social psychology and sociology rather than the prescriptive theories of contemporary education. Some readers may also be unfamiliar with the processes of analytic partitioning. Because we had no well-established vocabulary with which we could recognize the boundaries of classroom activities, we have instead chosen to study those components of activities that might vary independently of one another and which together paint a picture of classroom activity structure. Thus, our concern here is with the identification of communicating groups, with the assignment of roles to those groups and individuals to the roles, with the identification of classroom locations, with the study of the content and mode of the group's concern. Each of these concepts represents a facet, a conceptually independent dimension, of classroom activity. And, as will be shown in abundence, classrooms are both similar to one another and are predictably different from each other in terms of these activity components.

One of the basic tasks of this report, then, is to express a vocabulary for discussing the components of classroom activities. This task is limited in two senses. First, our primary concern is with the activities of lessons. Second, the terms presented are those for activity components and not a vocabulary for "Typical activities" that appear in various types of classrooms. Despite these limitations, to our knowledge this is the first major attempt to examine classroom activities as a field of investigation. Although our work is closely related to research activities of a number of others who are also working in the classroom (see Chapter II), none of these others has focused explicitly on the problem of activities. Why then study classroom activities?

Activities and Other Educative Events

There are at least three motivations that lead to the study of social events: Curiosity, generalization, and application. In terms of the first, one studies the classroom because it is there, because it is pervasive, because one is curious about social phenomena. In terms of the second, one studies the classroom as an examplar of social interaction, in order to formulate general principles that will lead to insights about broad fields that are represented in classroom events, such as socialization, decision making, leadership, or interpersonal influence. In terms of the last, one studies classroom events because one is convinced that through a knowledge of classroom processes one can effect predictive control over education. After all, it is in the arena of the classroom that teacher training, textbooks, educational media and devices, and all the other investments of education will have their impact on the pupil; and it is only in the classroom itself that these educative events occur which will shape the growth, development, emotional maturity, and continued motivation of pupils.

But these motivations apply equally to the study of all forms of educative events -- from individual learning sequences, through the influence of peer groups in the school, to a study of contemporary curricular changes. Why should one study classroom activities in particular?

Three answers suggest themselves. In the first place, classroom activities are prevasive; they constitute an important set of stimuli to which we are all exposed. Each of us enters a classroom for many thousands of hours during his childhood. In fact, we spend far more of our formative years in the classroom than in our homes, churches, or in any other single institution! In addition, more than a million teachers occupy positions of authority in American classrooms. In short, the social phenomena of the classroom are both widespread and of pervasive impact; they are important.

In the second place, classroom activities must be presumed to have a specific effect on classroom participants. In part, this effect will be direct. Since activities comprise the most general characteristics of classrooms, they will also represent a large proportion of those events which affect the success or failure of classroom education. This influence of activities is well recognized in the reports of teachers or pupils about their classroom experiences. Lessons were "dull," or "boreing"; the class itself was "apathetic" or "bright eyed and busy tailed"; pupils were said to have "created a riot"; and so on. In addition, classroom activities may also be presumed to provide a context or background against which the details and meaning of individual behaviors are played out. To give but superficial examples, a loud command cannot be interpreted for its auditory effect until we know the background noise level; or again, a given comment may be appropriate, inappropriate, funny, serious, a contribution or a hindrance, depending on the activity context in which it was uttered.

Finally, classroom activities should be studied now because they have been so systematically ignored to date! As will be suggested in Chapter II, the majority of those who have concerned themselves with classroom interaction prior to now have concerned themselves with units of individual behavior. Teachers' actions, attitudes, manners, even gestures have been studied. Pupil's responses, alertness, attention have been judged. But to date only a handfull of investigators have attempted even to rate lessons for their activity components, and in most cases those studies have dealt with "classroom atmosphere" as judged wholistically or as estimated from individual teacher behavior. This lack of attention to the activity concept is presumably an historical accident (certainly the majority of today's educational researchers were trained initially as psychologists rather than as sociologists or anthropologists). It has nevertheless colored the research decisions and concepts used by those who have studied classroom events, and the fact remains that few investigations of activities have been reported to date.

It is not, however, contended here that activities are the only type of educational phenomena worth studying. On the contrary, classroom activities should be investigated along with other forms of events pertaining to education. Let us look at the problem of relating classroom activities to other educative phenomena in the form of a paradigm. Figure 1-1 presents a model in which classroom events are suggested as a bridge between events that are presumed to have some effect on the classroom (independent variables) and educational consequences (dependent variables).

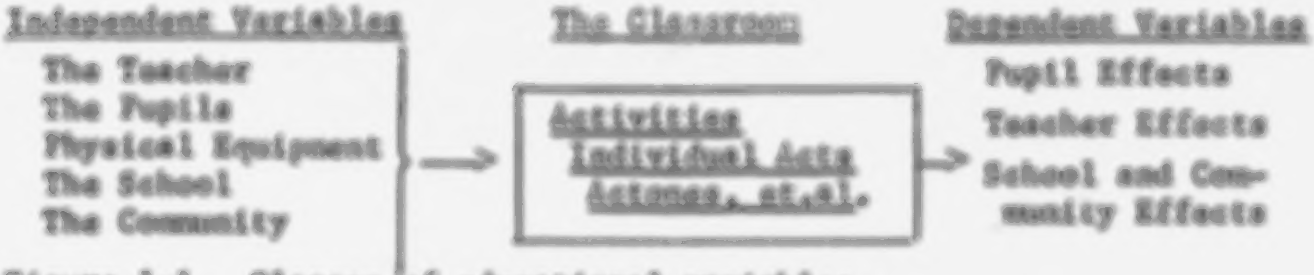
Independent Variables
The Teacher
The Pupils
Physical Equipment
The School
The Community
The Classroom
Activities
Individual Acts
Actones, et.al.
Dependent Variables
Pupil Effects
Teacher Effects
School and Community Effects

Figure 1-1. Classes of educational variables.

Among the former are characteristics of the teacher (such as his age, sex, training, abilities, race, and other factors that may be reflected in classroom behavior or reactions of others to the teacher), characteristics of the pupils (such as social class, ability, and the like), the physical equipment available in the classroom, the school (such as its schedule, size, organization, and culture), and the community in which the school is imbedded. Among variables that may be examined for dependence on classroom events are pupil effects (including the ubiquitous concerns over pupil attainment, attitudes, motivation, ability to work independently, creativity, and the like), teacher effects, and effects of classroom events in the school and community.

Even within the classroom itself, it is possible to recognize a variety of different types of social units. Those suggested in Figure 1-1 range from the molar concerns of classroom activities through individual acts with which meanings are exchanged down to the smaller units of actones, phonemes and the like. It is explicitly presumed here that units at these various levels may be conceptualized and may be studied independently of one another. However, to do so is to study but a portion of the problem. Unraveling the Gordion Knot of classroom interaction requires an integrated understanding not only of activities but also of acts and act sequences, and then a relating of these classroom events to both their antecedents and consequences. In terms of such a large design, the present study is only a beginning.

The Empirical Study

This volume also reports the results of a field study of activities that actually occurred in thirty-two, selected classrooms. In fact, approximately two-thirds of its pages are taken up with results from that investigation. In order to conduct such a study of classroom activities it was necessary to develop unique physical equipment, to choose a sample of classrooms, to devise a system for the coding of classroom activities, and to develop a means for analyzing the unique data generated by the study.

The methodology chosen for studying activities was to record actual class lessons on videotape. The medium of videotape was chosen (a) because it provided both a visual and auditory record, (b) because of its flexibility and immediate usefulness. In order to make the recordings of the study a system was developed including two recording cameras that are mounted in glass-fronted boxes, image blending equipment, microphones, cabling, a truck that is used for both equipment transportation and as a control console, and a play-back-coding facility. This equipment and its uses are described in Chapter IV.

The classrooms chosen for study constituted a factorial design in which the following variable factors were represented: *teacher age* (younger teachers -- those under thirty -- versus older teachers -- those over forty); *teacher sex*; *subject matter* (mathematics versus social studies lessons); and *grade level* (first, sixth, and eleventh grades). Choice of these independent variables was dictated partly by our conviction that they were likely to result in significant differences among classroom activities, partly with immediate application in mind, and partly through convenience. The fact was that each of these variables represented an obvious, overt characteristic of classroom life that was easy to "measure", was a possible candidate for later manipulation by school administrators, and did not represent any current controversies in the schools we were to approach for permission to make videotapes. The sample was also limited in a variety of more or less inadvertant ways. Classrooms were primarily from middle-class neighborhoods, participation was limited to cooperating teachers and schools, etc. As a result, the study cannot be claimed to be a "representative" one. It is unique, however, in that *four* independent variables -- teacher age and sex, subject matter, and grade level--were examined for their separate and interactive impact on classroom events. The extent to which these variables were a wise choice for study can be judged in the chapters where we report our findings.

The coding system devised for activity analysis depended both on the concepts we developed for dealing with classroom activities and the limitations of the videotape recordings. Both structural and functional aspects of activities were coded. Among the former we chose to look at communication structure, role structure, role allocation, role assignment, and the physical location of classroom actors. Among the latter, we studied both the content of communication and the communicative mode. In general these codes were made independeltly of one another, and a record was formed of activity characteristics for all coded elements for each second of the lesson hour.

Needless to say, data of the above complex, sequential type are not often encountered in social science research. Their analysis poses some interesting problems, some of which are discussed later in the volume (and particularly in Chapter VIII). We have chosen to present four types of findings from the analysis of activity data: characteristics of activities that applied to all lessons (Chapter V), independent variable effects on activities (Chapter VI), activity components that occurred coincidentally with one another (Chapter VII), and the sequences of activity components (Chapter VIII).

For the rest of the volume, Chapter II presents two models for the interpretation of classroom events (the model we began our research with and the one we developed as we went along). It also reports a detailed review and appreciation of other major, contemporary programs of research on the classroom. Chapter III is concerned with the definitions and codes used for concepts in our research. Chapter IV reports our methods in detail. Chapter IX summarizes some of our findings and discusses their implications briefly. Following the list of textual references there are also four appendices which comprise a bibliography of research on the classroom, supplementary coding rules, reliability scores, and a discussion of our statistical techniques.

Summary

In brief, the volume concerns the study of classroom activities. Activity concepts are proposed, operations are suggested, and a detailed study of classroom activities is reported. Classroom events are found to be differentially affected by four independent variables: age and sex of the teacher, subject matter, and grade level; and findings for these independent variables are both contrasted and interrelated. Findings are also presented for general activity characteristics, coincidental activity properties, and sequences of activity events.

Those who are looking for the immediate solution of educational problems -- for a description of teacher excellence, for a "solution" to the problems of slum education, or for definitive information on the encouragement of pupil creativity -- may be somewhat discouraged with this volume. Our concerns for the moment are not so much with the processes of instruction per se as with the characteristics of the classroom as an integrated social system. Teacher behavior is not here represented so much as an independent variable to the dependent variable of pupil learning as it is discussed as one portion of a complex environment that includes the behaviors of various pupils and the social and physical characteristics of the classroom.

But those who are looking for a vocabulary that truly describes (rather than prescribes) educational events, and those who are interested in the as-yet-poorly-explored fields of impact on the classroom of such independent variables as teacher age and sex, subject matter, and grade level will presumably find much to chew over in the pages to follow.

CHAPTER II

A GENERAL MODEL FOR CLASSROOM RESEARCH

When the first of the current scores of investigators of classroom processes were undertaken in 1963, the investigators had in mind a general model for classroom events. This model was originally reported by the senior author (Biddle, 1964) and subsequently a modified version was presented by both authors (Biddle and Adams, 1967). Since it has guided many of the substantive decisions taken in the research, the model is redeveloped here.

The chapter opens with a general discussion of the concept of a model. A preliminary model for classroom analysis is then presented. Next we turn to a review of recent programs of research on classroom behavior. Finally, a revised model that takes the earliest decisions into account, is put forward.

The Concept of a Model

As used here, a model consists first of a set of concepts presumed to map some aspects of the phenomenal world and second, some minimal idea of how the concepts would be applied in research investigations or findings. Models concern themselves with some limited set of events, for instance, with cognitive structure, with social structures, with institutions, or organisations, or socialisation, or the interior of the atomic nucleus, etc. Models are different from theories in that the latter also have a logically-ordered set of propositions to which the concepts apply. Models precede theories; models are used to stimulate thinking and research; models are necessarily limited in both the range of phenomena to which they presume to apply and to the number of conceptual distinctions they seek to use in understanding those phenomena. Some models are analogies, some may be drawn as figures, some are mathematical, still others are strictly verbal. It is literally impossible to "think" about any problem field without having models in mind. Science demands that the researcher make explicit his models. Should he not do so he runs the risk of overgeneralization of his results and of failing to recognize the incommensurability of his findings with those of others who use different models.

It should also be pointed out that it is rarely possible in the social sciences to conduct empirical research that meets all the conditions implied by a model. Typically the investigator examines only a limited sub-set of the concepts of any given model. Should his data, then, cause him to abandon the model he originally began with, some of the insights that originally underlay his model will not have been tested at all.

Models that attempt to map social behavior systems give evidence of concepts of two, general classes -- concepts for persons, and concepts for behavior. In dealing with the classroom, for instance, it is possible to recognize the teacher, the pupil group, individual pupils, pupils (or teachers) who play certain roles, the pupil who is in interaction with the teacher at the moment, deviant pupils, maladjusted pupils, and so forth. Concepts of this sort refer to the actors, the persons who inhabit the classroom and who emit the behaviors of classroom interaction. It is also possible, of course, to recognize content exchange, warmth, directive behavior, classroom management, the collection of milk money, general noise, confusion, behavioral deviancy, classroom norms--all concepts that refer to individual or group behavior. The fact that some terms refer to classes of people while other terms refer to classes of behavioral events should not give us any trouble, but often it appears to do so.

As will be seen in the review which appears in this chapter, a wide variety of models has been used for research on classrooms. Generally there are two reasons for this proliferation of models. First, investigators have often differed from one another in their choice of phenomena upon which to focus. A model for individual pupil behavior, for instance, has only partial overlap with another model that is concerned with the behavior of pupils as a group. Concepts designed to express action components of teacher behavior can have only minimal relationship with other concepts that focus on the manner components of teacher behavior. Models differing in focus may frequently be compared or may, at a later date, be assembled into a more comprehensive model in which all components are related.

However, many classroom models differ from others not in terms of their focus but rather in terms of the concepts used to express apparently the same material. For instance, one investigator (Flanders)[1] provides an apparently exhaustive list of seven categories for encoding teacher action while another (Perkins) provides another list of nine categories, only four of which are apparently identical to those of the first list. Models of these latter sorts are, in fact, only partially explicit. Generally they are reasonably clear in the persons or forms of classroom behavior upon which they are designed to focus, but partially or totally unclear as to the underlying facet structure which generates the conceptual distinctions for which exhaustiveness in representing behavior is claimed.

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[1] Numerous references appear in this chapter without date. These refer to programs of classroom research that are summarized as a supplementary bibliography -- see Appendix A. Dated references appear in the standard bibliography found at the end of the volume.

As a strategy, we shall present here a deliberately broad model. The model discusses both person and behavior concepts and is designed to provide a framework in which both our own research and those of others may be understood and compared.

A Preliminary Model for Classroom Analysis

In presenting a model for classroom analysis we shall use the following strategy. First an overview of the model is presented in which the major classes of classroom phenomena are outlined. Second, interrelations among the major classes of classroom phenomena are explored. Finally, implications of the model are spelled out.

Classes of Classroom Phenomena

Observable phenomena in the classroom may be analytically partitioned into four variable classes: teacher behavior, pupil behavior, the social environment, and the physical environment. We begin the discussion with a brief consideration of each of these classes.

Teacher behavior. By teacher behavior we mean those observable characteristics which may be said to differentiate either one teacher from another or a teacher at a given moment in time from the same teacher at some other moment in time. As defined, teacher behavior may be said to differ from teacher *features*, those characteristics which change but slowly and over which the teacher has presumably little control. Examples of features include age, sex, general body build, states of infirmity, voice quality, and the like. Examples of behaviors include lecturing, scolding, speaking sweetly, stammering, blushing, being responsive, loss of temper, the use of colloquialisms, and the scratching of one's head.

Theoretically, behaviors may vary over a wide range within any given situation; indeed, it is the potential variability of behaviors that distinguishes them from features. Teachers in the classroom "might," for instance, take off their clothes, talk baby-talk, or recite risque limericks. In actual fact, however, teachers normally do *not* exhibit these behaviors in the classroom. Thus teachers may be said to be more alike in their classroom behaviors than are the behaviors of people chosen at random. Moreover, individual teachers also tend to exhibit greater homogeneity of behavior from time to time than does a randomly chosen set of teachers. The individual teacher, for instance, often has a "style," a characteristic "mode of address," a "manner of presentation" or "accent." Patterns of relatively unchanging behavior we shall term *traits*.

Behaviors of the teacher may be classified in many ways. For some purposes, for instance, it is useful to distinguish teacher actions -- active components of behavior -- from teacher manners -- passive behavior indicators. However, we delay until the next major section of the chapter a general discussion of the most useful concepts for partitioning behavior.

Pupil behavior. The same general observations made about the behavior of the teacher may also be made about the behaviors of pupils in the classroom. Pupils are characterized by certain unchanging features, by behaviors that may be described actively or manneristically, and by traits that typify them from one moment to another. In the long run, a common system of concepts should enable us to explicate both the behaviors of pupils and the behavior of the teacher. Nevertheless, in most classrooms teachers exhibit a wider behavioral repertoire than do pupils. Teachers' behaviors are also characteristically distinct from pupils' behaviors. Teachers, for instance, are more likely to lecture, to lead, to admonish, to instigate, while the pupils are more likely to sit quietly, to respond, to deviate from explicit directions given by the teacher.

On the other hand, the fact that these differences between teacher and pupil behaviors are prescribed by educational tasks and ideology should not blind us to the fact that occasionally individual pupils assume the behaviors of the teacher and vice versa. It is possible, for instance, to observe a classroom in which an individual pupil gives a lecture and the teacher sits at the back of the room. As we shall see, some previous schemes for the observation of pupil behavior have set up categories upon the assumption that pupils are normally in an audiential role. Such systems falter when faced with the variety of observable pupils' behaviors in the modern classroom.

The social environment. The social environment consists of the joint properties of social interaction that may be observed to take place at any given moment in time or characteristically over time in the classroom. For instance, classrooms are characterized by common patterns of traffic movement, by rates of interaction, by physical and social groupings of actors, by modes of usage of physical equipments. As in the case of individual performances, some characteristics of the classroom social environment are stable while others change rapidly both within a given lesson, and over the classroom day. Stable patterns, or customs, may be observed, for example, in the number of persons who normally inhabit the classroom lesson, in the role relationships observable within the group of pupils, in the prevalence of the "lecture" form in some classrooms, or in the rate at which communication is exchanged. Other aspects of social environment are more likely to vary, particularly the exact subject matter being discussed and the moment-to-moment pattern of communication. Some classrooms have rigidly fixed customs, while others particularly at the lower grade levels tend to exhibit greater variability.

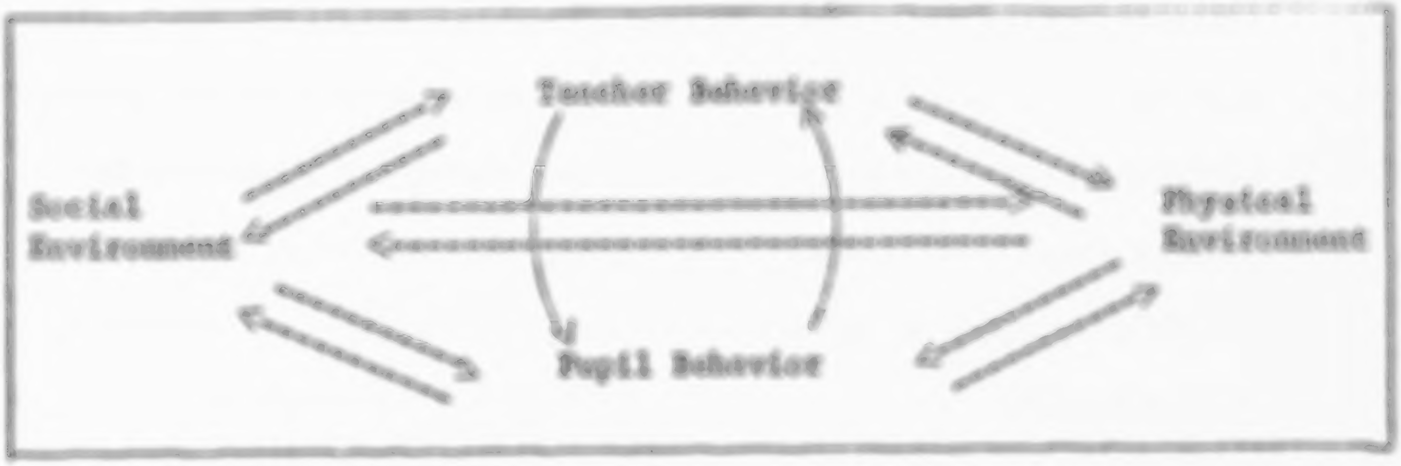
It should be emphasized that concepts applying to the social environment are defined independently of concepts applying to the behaviors of teacher or pupils. A "lecture," for instance, may be observed as a form of behavior regardless of who constitutes the lecturer or the audience members. In order to judge a traffic pattern or the existence of a communicating group, it is necessary to observe the joint activities of more than one person. Analogously, the fact that each member of an orchestra may be playing harmoniously by himself does not necessarily mean that the orchestra as a whole is in tune. The concept of intonation in an orchestral chord is characteristic of the social environment of the concert in the same sense that the concept of a role structure is characteristic of the social environment of the classroom -- and both may be directly observed. . . .This does not rule out, of course, the possibility that individuals may affect, or be affected by, social environments. On the contrary, certain actor behaviors may not only touch off but be necessary for the persistence of some social environments and vice versa.

The physical environment. The physical environment consists of those characteristics of the classroom setting that may be measured in physical terms. Some of these measures are wholistic; for example, the heat, humidity, light, and sound level. However, the classroom is normally a box-like structure which is a gestalt consisting of a great many parts that may be described by individuals and in terms of which their performances are organized. For instance, most classrooms have doors, windows, and other openings at various points in the walls. They have desks, chairs, file cases or other impedimentia that may be used by individuals and which will, to a certain extent, constrain patterns of possible social relations. Classrooms also have various educational media such as blackboards, books, pencils, television sets, and teaching machines. They also have a number of non-instructional objects such as waste baskets and coat racks. Some aspects of the physical environment are stable (the size of the room, its flooring, its heavier furniture), while other aspects may be moved, improved, created, damaged, or destroyed (books, chalk, lighter furniture, windowshades).

Interrelations Among Observable Phenomena

The four classes of observable phenomena in the classroom discussed above may be symbolically represented. Figure 2-1 displays a rectangle that symbolizes the classroom. In this rectangle may be found the four observable classes: teacher behavior, pupil behavior, social environment, and physical environment. Figure 2-1 also presents a number of arrows that indicate possible influences that these phenomena may have on one another. Note that the heaviest arrows drawn are between teacher and pupil behaviors suggesting that most research done to date has focused on these two classes of phenomena. It is quite possible, however, for pupil or teacher behaviors to reflect environmental conditions, for environments to reflect the behaviors of individuals, for the physical and social environments to interact, or for relationships between two variable classes to be affected by conditions in a third (or fourth). Since relationships of these latter kinds are probably less familiar to the reader, we suggest a few

Figure 2-1. -- The classes of observable phenomena in the classroom and their possible relationships.


Teacher Behavior
Social Environment
Physical Environment
Pupil Behavior

hypotheses in the paragraphs below.

Determinants of pupil behavior. Those who plan the physical environment of the classroom often make assumptions about its impact on pupil behavior. Pupils' desks are planned, for instance, to facilitate seat-work, ease with which pupils can move in and out of "their" desks, and to facilitate re-arranging of the classroom by the teacher. Equipment varies in the kinds of effect they have on pupil behavior. Some objects in the classroom context, in fact, have such a pre-potent effect as to constitute "seductive props" -- the introduction of a snake or frog into the elementary classroom normally transcends all other stimuli. Others, less dramatic, tend to invite boredom and restless pupil behavior.

Not less important in determining pupil behavior is the social environment. Sophisticated teachers often recognize the importance of propinquity when they separate two pupils who are egging one another on toward deviancy. Discussion groups may be used for increasing the degree to which individuals may verbalize their understandings or concerns. The classroom that is noisy, cheery, or sullen exerts striking effects on the behaviors of individual pupils and individual pupils may be seduced or coerced into playing certain roles in classroom interactions. Kowatrakul discovered that pupil behaviors varied systematically as a function of the sub-group activities of the classroom, for instance, that deviant behavior was more likely in discussion groups than in other communicative forms.

Determinants of teacher behavior. Teacher behavior, too, may vary as a function of the physical and social environments. Classrooms that are dull and drab, or noisy, or crowded make the job of the teacher far more difficult. The provision of educational media not only facilitates presentations by the trained teacher; they often free him to devote more of his energy to counseling and other non-instructive tasks. The sensitive teacher also responds to the cues of the social environment, watching his audience for their reactions, interpreting puzzled expressions, enthusiasms, withdrawals, deviancies, and evidences of fatigue as each are encountered.

Determinants of the social environment. It is patent that organized teaching requires the teacher to set up and control social environments. Classroom management is, in fact, a major concern for beginning teachers who are frequently overawed with the tasks of keeping order, managing discipline, separating combatants, maintaining a cheerful atmosphere, and keeping down the noise level. Even inadvertent teacher behaviors may have an effect on the social environment. Kounin and Gump have demonstrated the "ripple effect" of varying deviancy-control techniques on those pupils who merely look on.

It is not less true that the individual pupil has an effect upon the environment. The sarcastic comment at the beginning of a lesson, for instance, can set the whole mood or tone; "behavioral contagion" can spread from one deviant to others (see Lippit, Polansky, and Rosen, 1952); the presence of one or two serious students can set a high standard of achievement and enthusiasm; and so on. Even the physical surroundings can affect a social environment, particularly when light is low, noise level is high, conditions are crowded, or inadequate or inappropriate classroom equipment is provided.

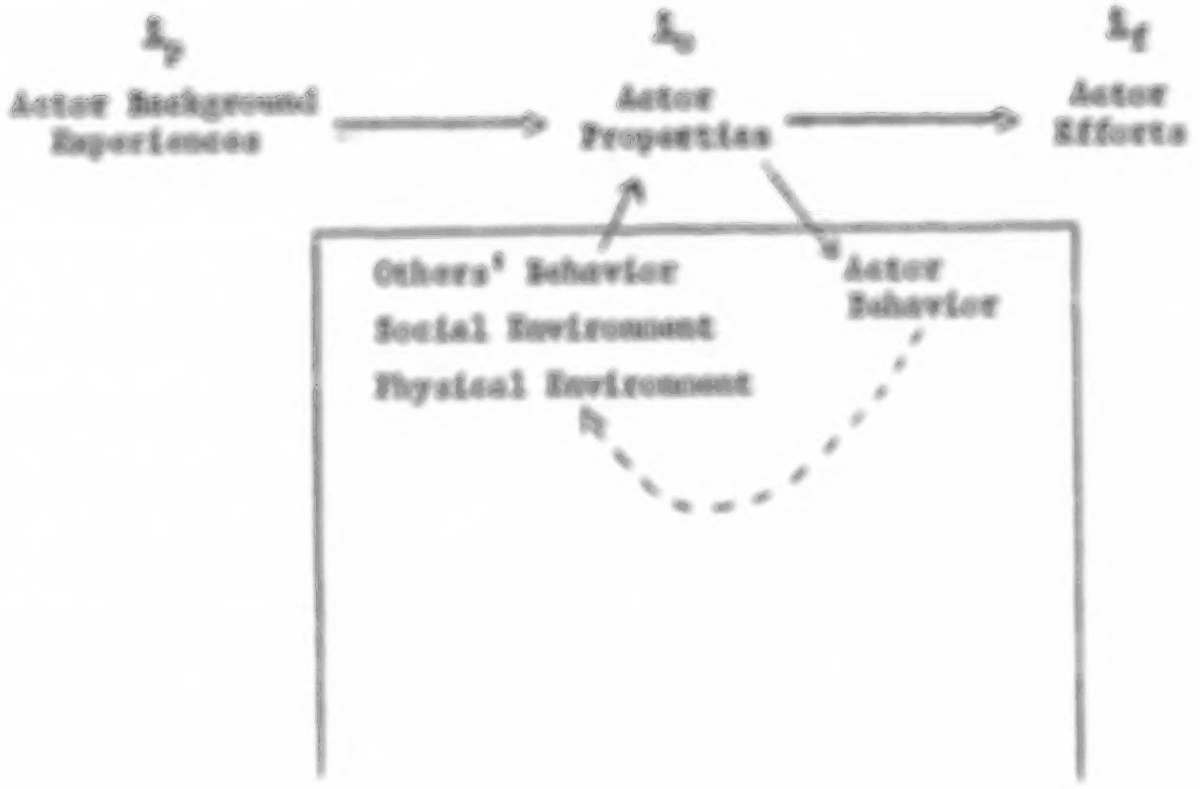
Determinants of the physical environment. It is common to assume that the physical environment operates primarily as an independent variable in the classroom - affecting both social environment and individual behaviors. The physical environment may also, however, appear as a dependent variable in its own right when, for instance, the art productions of a class are hung for public display. Teachers may also rearrange the equipment in the room - for instance, changing the desks from a line-and-row plan to a circular one. Pupils are often judged for their care and skill in manipulating environmental props. It is noteworthy, however, that few persons appear concerned with the physical effects of classroom processes (other than the janitor who must clean them up), although occasionally a principal may use the disarray of the classroom as an evidence of teacher incompetence.

Interaction in environmental context. As an example of the mediation of relationships between two variable classes and a third, consider the effects of social environment on teacher-pupil interaction. One normally assumes that the warm and supportive teacher has a happier and more compliant classroom than the firm or dominative teacher. But is this equally true when the environment exhibits a pupil who is challenging the rules? Kounin and Gump have shown that the "firm" teacher not only exacts compliance from the deviant pupil but also has positive effects on onlookers while the "rough" teacher succeeds mainly in disrupting behavior. These findings are probably unique to the "deviancy control incident." In another example, teachers of two or more classes identical in subject matter are often aware of differential success depending on the characteristics of the pupil group. In one class it is difficult to get pupils interested, whispering goes on incessantly, deviances occur, pupils are non-responsive even to teacher humor. In a contrasting class,pupil interest may be so high that much of the instruction becomes self-instruction on the part of pupils. Not only are teacher and pupil behaviors distinct in such contrasting environments, but the same teacher behavior that is "successful" in one situation may be "disastrous" in the other. Again, sensitive teachers are usually conscious of the need to adjust their communications to the social positions or roles of the particular pupil; some pupils need encouragement, others firmness, and still others to be jollied along. The teacher who is skilled in environmental manipulation - one who, for instance, can make appropriate use of small groups, skills of the individual pupils, and the introduction of appropriate physical props - will have a totally different pattern of interaction with pupils than the teacher who relies on lecturing only.

Unobservable classroom characteristics. Despite the fact that they may not be observed directly, it is also useful to conceptualize a number of other phenomena that are tied to the observable properties of the classroom. These additional properties are conceptualized not only to account for the persistence of classrooms as common social phenomena but also to explain the apparent regularities of behavior of those persons who enter classrooms. They also help us to deal with the learning model found not only in educational ideology but also in most studies of educational effects.

Unobservable individual properties. Consider first the model for the psychology of the classroom actor as presented in Figure 2-2. In contrast with Figure 2-1, portions of Figure 2-2 lie outside the observable classroom. The actor, be he the teacher or a pupil, is presumed to come to the classroom with certain *unobservable actor properties*. These properties constitute the complement of psychological factors which may be used to explain his behavior including his perceptual apparatus, his motives, his attitudes, his beliefs, his cognitive structure, and so forth. We make an assumption that the properties evidenced by the actor are a function of the *background experiences* through which the actor has gone, his initial socialization, the social class and home environments in which he grew up, the types of schooling he has had. It is also reasonable to assume that through the interaction between the actor and his environment certain *effects* will be produced in the future. These effects will, in fact, be various types of actor properties and behaviors that are to occur at a later time. Furthermore, it is reasonable to presume that future effects will reflect not only educational experiences in the classroom but also other actor experiences in the school, the actor's family, and elsewhere.

Figure 2-2. -- The classes of phenomena involved in the psychology of the classroom actor.


t_p
Actor Background Experiences
t_o
Actor Properties
t_f
Actor Efforts
Others' Behavior
Social Environment
Physical Environment
Actor Behavior

In examining the relationship between the properties of the actor and actor behavior, we must make the assumption that behavior reflects not only actor properties but also the preceptions the actor has of others in the classroom, the social environment, and the physical environment. Thus, the properties of the individual actor, his behavior, and the overt characteristics of the environment arrange themselves in a loop-like structure in which the actor behaves as a function of his properties, his behavior in turn influences others, and the behavior that is emitted by others in turn influences the actor's future behavior.

Multiple classroom actors. It should be noted that Figure 2-2 may be applied either to the teacher or to the pupil, both of whom are actors in the classroom arena. Our intent is to suggest that both teachers and pupils come to the classroom with properties. For both alike, their properties are a function of background experiences. Both may alter their properties as a result of participation. Furthermore there are as many looped systems of individual properties, behaviors and reactions as there are individuals in the classroom.

The fact that a classroom has multiple actors (and in particular, numerous pupils) has two implications. In the first place, the nature of the social envionment differs slightly depending on the viewpoint of each pupil. For pupil 1 the social environment is generated by the teacher and pupils 2 through n. For pupil 2, pupil 1 forms part of the environment, and so on. To this extent, then, it may be said that the actors in the situation do not in fact inhabit a common social environment; that each is faced with a certain distortion due to the peculiarities of his own standpoint. We shall make an assumption, however, that distortions resulting from the unique standpoints of each member are minimal and that it is useful to conceptualize a common social environment in which all actors are members. This assumption necessitates our restricting the concept of social environment to "public" aspects - to events that are presumably observable and audible to all participants. Although a whispered interaction among three persons may constitute a social environment for the participants, this environment (at least its communicative content) cannot form part of the shared environment of others in the classroom.

A second problem raised by the phenomenon of multiple pupils is that of a changing environment as the teacher shifts from one pupil to another. Let us assume that the teacher is interacting with pupil 1. At the moment in time that this interaction is taking place we shall refer to it as the micro-environment, whereas the environment involving all persons is the macro-environment. As used here the micro-environment is but one type of communication group that may be seen to exist in classrooms. As a matter of fact, in some classrooms it may never occur (where the teacher is completely quiet or always addresses pupils in audiential groups). Nevertheless, the micro-environment is frequently present in classrooms and has such presumed pre-potency that, as we shall see, some investigators have already developed concepts for it in abstraction.

Social properties. Quite apart from the properties characterizing the individual actors of the classroom, there are also unobservable social properties standing behind the social environment of the classroom itself. Classrooms are not assembled through the whim of teachers and pupils who participate in them. Rather they are formed for specific task purposes which are embodied in the goals of community members who set up and pay for a school system. The task of the classroom is that of socializing pupils; although various goals of socialization may be (vaguely) recognized. Certain kinds of regulations and rules are also imposed on the classroom by administrative arrangement. Normally, for instance, the class is given a grade and subject matter assignment. Moreover, the classroom exists in a social context that has informal properties stemming both from within the school and from its embedding community. The teacher is a member of various cliques and organizations, pupils represent various social classes and castes, and members often bring to the classroom the knowledge of these unobservable characteristics which "everyone knows" about each individual. (To appreciate the extent to which informal social properties may dominate educative processes see Gordon, 1957.)

(Vacuously, the classroom is also characterized by an external physical environment in the form of the building in which the classroom is found, the attitude of the community, the weather, and the like. For all practical purposes we can ignore these unobservable physical properties, or rather deal with them only to the extent that they are symbolized by classroom actors.)

Structural Characteristics of the Classroom

While our major concern in this chapter is with those characteristics of the classroom that change during the course of the lesson, many of the above concepts may also be used to characterize stable or structural characteristics of the classroom.

For instance, teachers may be differentiated from one another in terms of their physical features: their age, sex, race, physique, voice quality, stature, or handicaps. In fact, some school systems make it a practice to assign teachers in terms of age, sex, race, and the like and to deny access to certain jobs in the system to teachers with the "wrong" features, regardless of their otherwise excellent qualifications. It is more common, however, to hear teachers characterized in terms of their traits or properties. Teachers are often thought to be competent or incompetent, to be warm or cold, pupil-centered or subject-oriented, trained or untrained, and to possess certain skills.

Pupils, too, may be characterized by their unchanging features, traits, or properties. Pupils also exhibit ages, races, physiques and the like. For instance, some teachers are concerned with the youngest or oldest child in the class, with the child who (alone) represents racial characteristics differing from those of the other children, or with the effects of the introduction of a handicapped or maladjusted child into the classroom situation. Pupils may also be "bright" as a group, or may represent particular interests or skill qualifications.

The social environment and its properties may also evidence stable or trait-like characteristics. The size of the classroom is normally stable and has been used as an independent variable in numerous studies of the effectiveness of classroom education. Normally the position complement is also constant for a classroom: one teacher and thirty or more pupils. (It is rare to find anyone else in a classroom, and when a "stranger" enters the classroom it is often disruptive.) Traffic patterns, sub-groups, and role structure may also be stable, as may status relations among pupils and norms defining appropriate behavior. Grade, subject matter specified, and the nature of the educational task are almost certain to remain constant.

Finally, the physical environment also exhibits stable characteristics over which classroom participants have no control. The size, shape, building materials, and major artifacts are usually a "given" for the classroom. On the other hand, to know that physical features are present in the classroom does not mean that we know how they are used. The position in which a motion picture projector is "usually" found in the classroom is on a shelf gathering dust.

Pupil Learning as a Function of Teacher Behavior

One way of summarizing some of the implications of our model is to apply it to the usual paradigm of pupil learning. For purposes of this discussion it will be assumed that most educators presume a paradigm in which teacher classroom behavior leads to learning on the part of the pupil. Thus the normal pattern of educational investigation is to look at the influence of various forms of teacher behavior (for instance, forms of instruction, teacher mannerisms, or teacher disciplinary techniques) on changes in pupil properties (achievement on standard academic tests, attitude change, or social adjustment).

This simple paradigm has a number of shortcomings in terms of the model presented in this chapter. In the first place, the classroom is not a Skinner Box. Although learning theory presents us with sophisticated and well-supported theorems relating patterns of stimulus variables to patterns of learning, we do not in fact know what kinds of stimulus variables characterize the average classroom. The teacher, of course, is one of these variables. So are the other pupil actors plus the physical and social environments. These latter factors are but partially under the control of the teacher and may either vitiate the teacher's efforts or may provide additional, unintended educative experiences.

For example, the individual pupil is going to have some difficulty in paying attention to the teacher if he is being tormented by the pupil sitting next to him. Again, the physical environment of most classrooms may be noisy; it may also be too hot or cold, or its illumination may be poor. It is also possible that the pupil may learn more from the "reinterpretation" of the teacher's message provided by his neighbor than from the teacher, or it may turn out that some pupils are inordinately sensitive of classroom "atmosphere" and the collective opinions of others.

Another difficulty with the simple learning paradigm is that the pupil plays two roles with regard to the instructional situation, an active-responding role as a member of the micro-environment, and a passive-audiential role when watching the teacher interact with others. In the simple learning paradigm the pupil is visualized as a direct respondent to teacher behavior. Unfortunately the teacher is but one person and is faced with thirty or more pupils. Thus, most of the time pupils are in audiential roles in which they cannot speak out their doubts or trial answers for direct feed-back. This suggests that the teacher is not an ideal "stimulus device" for the typical pupil. Rather, most pupils are either bored by the repetition of materials they already know or confused by the over-rapid presentation of things they do not understand - or perhaps both bored and confused in alternation.

Third, and perhaps of greatest importance, there are many possible routes by which the teacher can influence the learning of the pupil, and only one of these is the direct route of teacher behavior impact on the pupil. Teachers may, for instance, contact pupils with regard to helping others with their homework; or the teacher may manipulate the physical environment in some way as to affect pupil learning (such as the use of educational media); or the teacher may set up social environments that are conducive to high pupil motivation and involvement. Gump suggests, for instance, that teachers have their greatest impact on pupils not as "stimulus devices" but as environmental manipulators, that there will be more variations in pupil behavior (and learning) as a function of variations in the social environment than variations in teacher behavior. If Gump's suggestion is valid, we should put as much if not more time into studying the relationships between teacher behavior and social environments, on the one hand, and social environments and pupil learning, on the other, as we spend studying the direct effects of teacher behavior on pupil learning.

Beyond this point, to conduct studies of classrooms making the assumption that only one cause (teacher behavior) leads to only one outcome (pupil learning) is to be scientifically imaginative. It is perfectly possible, as has been suggested, for the classroom to have other outcomes than those of pupil learning. The teacher may change as a result of classroom participation; may learn, may grow, or may become sour and embittered. Social environments created in one classroom may be applied in other situations: friendships, dominance relationships, norms of interaction may be taken from the classroom into other school and non-school settings. Even the physical environment of the classroom may occasionally be viewed as an effect. To concern oneself with these other outcomes of classroom interaction is to suggest a far wider range of questions - which in turn affects the forms of conceptualization used for studying the observable phenomena of the classroom.

Review of Related Literature

It is beyond the scope of this chapter to provide a detailed review of all related empirical studies of classroom interaction. Excellent recent reviews have been provided by Withall (1960),Medley and Mitzel (1963), Kliebard (1966), and Weick (1967); while two extensive reviews have also been prepared by the investigators (Biddle, Fraser, and Jellison, 1965, Biddle and Adams, 1967b). The reader is urged to turn to these sources for a more extensive listing of studies and discussions of the problems of behavioral observation in the classroom. Instead, we shall review here five, specific problems of classroom research as they are handled in a number of recent, exciting programs of investigation. Our review shall be of coverage, methods of data collection, unit of analysis, conceptual posture, and concepts used. The reader is cautioned that in this brief compass we must of necessity do some violence to the studies cited; for instance, we cannot attempt here to summarize their findings.

Coverage

Given the complexity and high cost of classroom investigation, it is not surprising to discover that most recent investigations have concentrated on but a narrow range of classroom types. Various criteria have been used to specify the type of classroom with which a particular investigation should be concerned. These have included:

Grade Level

Selected grades -- Perkins, Gump

Primary grades -- Hughes, Taba, *et al*

Secondary grades -- B. O. Smith, Nuthall and Lawrence

Subject Matter

Selected subjects -- Flanders, Bellack, et al

Social Class of Pupils

Upper or middle class -- Perkins, Jackson

Lower class -- L. M. Smith and Geoffrey

Achievement of Pupils

High achievers -- Taba, et al

Low achievers -- Perkins

Other Pupil Variables

Emotional disturbance -- Kounin

Other Teacher Variables

Rated competence -- Jackson

Again, where various classroom structural conditions have been investigated in recent studies it is not at all surprising to discover that the range of variables chosen is quite limited. Variables studies have included:

Subject Matter -- Flanders, Hughes

Teaching "Style" -- Hughes

Teacher Training -- Flanders, Waimon and Hermanozicz, Taba, et al

Nationality Differences -- Flanders

Phases of the School Year -- L. M. Smith and Geoffrey

These evident limitations of both coverage and classroom variability have had several effects on the fruitfulness of recent classroom research. First, many studies have appeared to express concepts, methods, and an outlook that is unique to the particular type of classroom investigated. As an example, in the investigations of B. O. Smith and Bellack et al, which are limited to secondary classrooms, there appears to be an assumption that most meaningful classroom interaction is verbal -- an assumption that would be less valid at the elementary level. Second, results reported represent but a restricted range of classroom events. This may be appreciated most vividly in the work of L.M. Smith and Geoffrey who, alone among the investigators reviewed, have dealt explicitly with the lower-class school. Finally, the fact that but a single or at most two or three structural variables are studied in the typical study restricts the possibility of discovering interactive effects.

It seems clear that in any reasonably complete study of classroom phenomena it will be necessary to cover a wide variety of classroom conditions and variables.

Methods of Data Collection

Recent studies of the classroom have differed widely from one another in terms of methods used for the collection of data. Following Weick (1967) we shall distinguish here between two, analytically separable processes -- behavioral recording and encoding. Recording takes place when behavioral events are "frozen" into some permanent record, such as a sound or visual recording. Encoding takes place when behavioral events or records are converted into a form suitable for counting and tabulation. As we shall see, classroom studies have been reported in which neither recording nor encoding occurred, in which encoding alone was used, and where both processes were relied upon.

Participant observation. The broadest and simplest methodology used in classroom studies is that of participant observation. Participant observation occurs when the behavioral scientist enters a new social system unobtrusively to take detailed, non-systematic notes and to develop insights about the culture of the system. Recording, encoding, data analysis, and synthesis all takes place in the mind of the participant observer. Thus, participant observation involves neither recording nor encoding in the formal, replicable sense. Since the observer's task is to develop insights, rather than to test hypotheses, participant observation is probably the best method available for conceiving new concepts and relationships; since it does not provide replicable results, it is a poor technique for testing hypotheses. Examples of participant observation in the classroom may be found in the works of L. M. Smith and Geoffrey, and Jackson.

Systematic observation. It is possible, of course, to place a behavioral observer in the classroom whose task is the systematic encoding of behavioral records. Studies using such techniques exhibit replicable methods of encoding but not of behavioral recording. By far the majority of studies of classroom interaction have used various forms of systematic observation, and following Medley and Mitzel (1964) we shall distinguish three varieties.

Post-session rating occurs when the behavioral observer is asked to delay behavioral encoding until after the class session is finished. Ratings are then made of various aspects of the class hour as a whole. Post-session rating procedures have been followed, in fact, for many years by educational inspectors and teacher raters (with ambiguous results). The best example of the use of post-session rating in a research context is provided by the work of Ryans. For purposes of serious research the post-session rating has serious defects; not only is the observer asked to integrate his impressions throughout the class hour for a single set of ratings, but the technique destroys all possibility of studying interactional processes during the class hour.

Sign observation takes place when the observer is provided a list of events "to watch for" in the classroom and must check off those events which take place during a given period. An example of this technique is provided by the OScAR technique developed by Medley and Mitzel. Sign observation has the obvious advantage of anchorage; that is, observations are closely tied to concrete events, and observers are asked to make a minimum of high-level inferences. However, it suffers various defects, particularly the fact that sign observation is tied to an arbitrary unit of time and cannot easily be adapted for the study of interaction. In addition, most useful lists of classroom signs are both extensive and (from the point of view of the observer) arbitrary.

Categorical observation occurs when the observer is provided a list of categories or scales into which events are to be coded. For instance, Kowatrakul asked observers to place the behaviors of randomly chosen pupils into one of six, pre-determined categories; Flanders provided seven categories for classifying teacher behavior; while Perkins used two observers in the classroom, one to categorize the teacher and the other to encode pupil behavior. When compared with sign systems, categorical observation is both at a higher level of abstraction and is more flexible. Categories may be applied to arbitrary time units, to selected events, or to naturally occurring event sequences. They may also easily be used for the study of interaction (see, for instance, Flanders).

All forms of systematic observation suffer a serious problem when used for classroom research -- that of observer loading. It is clear that any given behavior observer can only focus on a fraction of the events taking place in the classroom, can only observe in detail one or two classroom participants. Thus, all systematic observation techniques suffer both from content limitation and from unreliability of the encoding process.

Behavioral recording. Problems of content limitation and unreliability in the encoding process may be greatly reduced if the observers work from a behavioral record rather than from ongoing classroom processes. Behavioral records may be scanned repeatedly for multiple-coding, while the complex or unclear event may be scrutinized in detail and coded with reliability. Once again, various forms of behavioral recording have been used in classroom research.

Specimen records are narrative descriptions of behavioral events. As originally developed by Barker and Wright, the specimen record is a running narrative of everything that happens to an individual and his responses to those events. Specimen records were originally developed for children's behavior, but now have been applied to teachers (Hughes), to camp counselors and campers (Gump and Kounin), to parents, teachers, and pupils (Barker), and to a wholistic description of classrooms (Gump). Since specimen records are dictated by a human being who is physically present in the situation studied, they are apt to reflect two biases. On the one hand, those observed may adjust their behavior because of the presence of the observer. On the other, the record dictated has already been filtered through the selective and integrative mechanisms of the human observer. Of the two biases the latter is the more difficult to overcome, since all human beings tend to simplify, categorize, unify, and subjectively distort their impressions of events.

Sound recordings have also been used by a number of classroom investigators including Bellack et al, Nuthall and Lawrence, B. O. Smith, Taba et al, and Waimon and Hermanozicz. Although various means are available for making sound recordings, each of the above studies reports the use of electronic tape recordings. The major mechanical problem reported in these studies is that of the high ambient noise level found in most classrooms. (In some studies intelligibility of the audio record was increased by having the teacher wear or carry a small, cordless microphone.) The greatest inherent difficulty with sound recordings is that they provide no information whatsoever about the visual or tactile stimuli of the classroom. It is not surprising to discover, for instance, that the bulk of the above studies have dealt with classroom interaction at the secondary level -- where visual and kisthetic experiences are presumably of less prominence.

Visual recordings may also be made in the classroom. Gump, or instance, has supplemented his specimen records with time-lapse photographs. Despite the richness of visual information, however, most investigators have appeared to assume that the bulk of classroom informational exchange was either auditory or supplementary to audio information and have avoided the isolated visual recording.

Audio-visual recordings have been reported by at least two teams of investigators to date (those headed by Kounin and by Schueler, *et al*). The team headed by Kounin has used both 16mm sound motion pictures and videotape recordings, while the Schueler group used videotapes exclusively. In the Kounin study recordings were made of *in tact* classrooms using portable equipment which made use of two cameras so placed as to record the faces of all participants. The greatest difficulties reported for audio-visual recordings were their cost and the recurring problem of ambient noise in the average classroom.

Discussion. It seems clear that audio-visual recordings enhance the comprehensive, analytic study of classroom processes. However insightful the processes of participant observation may be, replication of their procedures is difficult. Specimen record data are both selective and limited. Systematic observation does not permit the studying of relationships among the many processes taking place simultaneously in the classroom. Only in the audio-visual recording is the full, behavioral richness of the classroom preserved for subsequent explorations and encoding.

Unit of Analysis

The size of classroom events does not concern the participant observer; he is free to choose acts, act sequences, or entire class hours or semesters for his unit of analysis at will. For the systematic behavioral encoder, however, it is necessary to specify a unit of analysis which will then be rated. Choice of the unit of analysis is both a methodological and theoretical issue, and classroom investigators have solved this problem in a number of ways.

Arbitrary unit of time. A number of investigators (for instance, Flanders, Medley and Mitzel, and Kowatrakul) have used an arbitrary unit of time as a basis for their investigations. Flanders, for instance, asks observers to make a judgment every three seconds, while Medley and Mitzel ask that a record of signs be kept for three minutes. The advantage of the arbitrary-time technique is its mechanical character, which facilitates the effort of an observer in systematic observation. One difficulty with an arbitrary time unit is that it does not reflect classroom events as they actually occur. Thus, however long or short may be the unit chosen, classroom events may be operating at another rhythm. Another difficulty is that classroom events are not only distinct from one another in time but also evidence an internal envelope. (They have initiatory, consummatory, and closing phases). The only way to pick up such information is to study naturally-occurring units directly.

Selected, naturally-occurring units. It is possible to confine one's attention in the classroom to units wherein the teacher is only lecturing, or to the study of interaction during "seat work." An example of such a focus is given in the work of Kounin and his associates in which the investigators sought for and rated deviancy control incidents. Units of deviancy control occurred when the teacher identified and did something about a pupil whose performance was "out of line." The difficulty with such procedures is that the materials rated form but a part of the ongoing stream of classroom events.

Analytic units. Some units of classroom observation are suggested by the nature of the concepts used by the investigator. For instance, in the work of B. O. Smith an episode is "one or more exchanges that comprise a completed verbal transaction between two or more speakers." Such a unit is defined analytically provided that the investigators conceptualize it and provide rules for its identification. Analytic units may or may not be recognized as "natural" units of classroom discourse by participants; normally they are discussed in abstract terminology that has meaning mainly to the investigators.

Analytic units come in various sizes and reflect various conceptual assumptions. One comprehensive set of units has already been suggested by investigators who have focused on direct exchanges between teachers and target pupils. The smallest of these units is the unit act -- generally termed a move. A sequence of moves consisting of a set of exchanges between the teacher and an individual pupil on a single subject matter is called a reciprocating episode by B. O. Smith. A somewhat longer sequence which may involve several target pupils is termed a coordinate episode, by B. O. Smith; an incident, by Nuthall and Lawrence; a teaching cycle by Bellack et al; and a teaching episode, by Waimon and Hermanozics.

Two still longer units are also suggested by Smith -- the strategy, a set of verbal actions that serves to attain certain results and to guard against others, and the venture, a segment of discourse consisting of a set of utterances dealing with a single topic and having a single overarching content objective.

Two difficulties appear with analytic units. Since analytic units reflect the sophisticated concerns of the investigator (rather than those of the participant) their use entails both the risk of moving away from phenomenal reality and the problem of having to translate results into some convenient form in which they can be used by educators. Again, since analytic units are clearly concerned with but one "view" of classroom interaction, to adopt a single analytic unit is to prejudice the outcome of using those units to test the adequacy of competing theories. To cite but one example, Nuthall and Lawrence attempted, with but little success, to use the reciprocating episode unit to test learning theory hypotheses in the classroom.

Phenomenal units. These two difficulties are somewhat overcome by the use of phenomenal units; "natural appearing" breaks in the stream of classroom processes that may reasonably be assumed to be recognized by classroom participants. The classic type of phenomenal unit was provided in Barker and Wright's concept of episode, a unit of individual behavior which exhibited constant direction, normal behavior perspective, and approximately equal potency throughout its course. Since the episode is basically a unit of individual motivation, it is reasonable to presume phenomenal awareness of episodes on the part of the subject, and Barker and Wright exhibit enormous fecundity in suggesting aspects of behavioral episodes that can be coded reliably. Additional phenomenal units that have bee derived from specimen records by the Barker group, include Environmental Force Units (Schoggen) and Social Contacts (Dyck). A somewhat different phenomenological unit -- the segment -- has been proposed for classroom activity by Gump. Classroom segments are marked by the gross breaking points in day-long classroom activities, such as when a teacher shifts subject matter, or when "the collection of milk money" is replaced by "show and tell." (Kounin uses a similar, phenomenal unit.)

That phenomenal units are a fruitful way of breaking down the individual's stream of behavior appears clear. But serious difficulties occur when we attempt to apply phenomenal units to joint activity -- such as classroom interaction. For one thing, the English language has but few concepts that apply unambiguously to social processes. As a result classroom participants appear unaware -- or at least cannot verbalize -- the joint properties of their environment. For another, the perception of social events by any given participant suffers from his unique perspective, with the result that he often lacks information about what is "going on" elsewhere in the classroom. Consequently, to work with phenomenal units for classroom processes requires that we choose units that are prominent (large or long) and are described in a common vocabulary that is shared by all. Units of such dimensions are not likely to tell us much about interactive processes.

Discussion. Despite their difficulties, it would appear that analytic units offer the greatest scope for studying classroom processes in depth. Arbitrary time units and selected, naturally-occurring phenomena are simply too limited in the information they provide. Phenomenal units lack analytic precision. Nonetheless, avoiding the problems of inadequate (or biased) coverage and the creation of a synthetic language still comprise the major difficulties associated with the use of analytic units. These problems will only be solved when ananalytic vocabulary is developed for education that is based on operational concepts and empirical research.

Regarding coverage, it is noteworthy that with but few exceptions recent studies of the classroom make use of but a single unit. Since only one system of concepts is being tried out, units are chosen to favor that system. One way around the problem is to use separate, analytic units for each type of data desired. (See procedures discussed in Chapter III.)

Regarding bias, ideally units should be designed in such a way so as to test a maximum of competing models suggested for understanding the classroom. Consider, for instance, the relationship between B. O. Smith's logical model and the learning model proposed by Waimon and Hermanozicz. The "usual" type of reciprocating episode studied by Smith begins with a teacher emission, continues with a pupil response, and is terminated by another teacher move; thus T-P-T'. In the learning model, the pupil emits a performance; this is followed by a potentially rewarding or punishing behavior by the teacher, and is terminated by a new pupil behavior; thus P-T-P'.

To study units of either the T-P-T' or P-T-P' sort precludes that one investigator would ever examine the other. However, to code the individual acts or moves of teachers and pupils allows both models to be studied. In fact, concepts of longer sequences of acts are suggested in seminal thinking by B. O. Smith, by Nuthall and Lawrence, and particularly by L. M. Smith and Geoffrey in their discussions of "banter" and the development of normative and belief systems in the classroom.

In part dependence upon longer analytic units in classroom studies has appeared to reflect not only a commitment to certain models of classroom interaction but also an unwillingness to use the computer as an aid in classroom research. In reported classroom research to date only Flanders has made a serious attempt to find out the simple sequences of classroom phenomena. Given the computer, complex sequence analysis is not only possible but also will enable us to assess the competitive strengths of logical, learning, leadership and other models of classroom interaction, and to help us generate new concepts for expressing the complexities of classroom events.

Finally, the use of synthetic language in the analytic process is perhaps more of a blessing than a problem. As in all fields, educationists have their own vocabulary, and our descriptions of classroom events tend to reflect more the strictures of our training than what is there to be observed. If research is to have a creative impact on education, one obvious way in which that impact will be generated is with a new vocabulary of concepts for describing classroom processes. A physical scientist would probably suggest that it is "high time" educational research developed its own, complex, analytic vocabulary. Certainly until it does, much of our research effort (and training effort) is misdirected and misinformed.

Conceptual Posture

One of the persisting problems of behavioral analysis is whether to observe the intent of behavior, its objective characteristics, or its effects. The problem may be illustrated by our observing an incident in which a younger child attempts to strike an older child. The motive of the younger child was hostility, his action was that of aggression, but the effect of his action was to create amusement in the older child. Each of these qualities -- hostility, aggression, amusement -- may be coded with reliability, but are all equally useful to code in the classroom situation?

It is clear that each of these postures finds adherents among those who have studied classroom processes. For Schoggen an act is identified by inferring the intent of the actor. For Flanders categories are offered which discriminate objective characteristics of action. While Medley and Mitzel have argued that the recording of effects is often more precise and valid than the recording of intent, and regardless of the intent of teachers, it is the effect of teacher action on the child that counts. It is also possible to discover these same emphases given to the observation of social (as opposed to individual) events in the classroom. Gump argues, for instance, for coding the "intrinsic type" of a classroom segment rather than what actually happened, while Perkins categorizes existing classroom structure.

It so happens that the implications of these various approaches to conceptual posture are distinct, depending on whether we are encoding individual or social processes. At the individual level it is perfectly legitimate to code intent, objective characteristics, or effect of behavior -- depending on one's interest. If our sole interest is in the determinants of teacher behavior, for instance, then judgments about teacher intent are appropriate. Judgments about the effect of teacher behavior on pupils would be more appropriate if our sole concern were with teacher competence. If our concerns are broad, however -- we are interested in competitively testing various models of interaction or in studying both the individual and social determinants of behavior -- we would be wise to emphasize the study of objective characteristics of behavior. Indeed, it may be argued that although our vocabulary for describing individual performance is "loaded" with intentional and effectual words, that the cues by which we make these judgments are drawn from overt performance characteristics.

The problem of conceptual posture is more complex at the social level. In particular, judgments about "social intention" are likely to suffer from unexamined inductive assumptions and teleological fallacies. Such unclear concepts as group goal or social purpose might possibly refer to written specifications or rules (such as school regulations); to shared, phenomenal intention on the part of participants; to judged outcomes of social activity (regardless of intention); or to quasi-stationary states of the social system. Often, however, they refer to inductively-reached conclusions on the part of the investigator -- in which case any data collected by rating instruments reflects only the inductive judgments the investigator has already reached. The problem of social effects is only slightly less bothersome. Social "functions" are often confused with social "intentions"; so much so that Merton has recommended we distinguish between manifest (intended) and latent (not intended) outcomes of social action. If we clearly restrict concern to the analytic analysis of social effects, then social functions may legitimately be studied. But abstract social effects may be difficult to judge, and many effects of classroom activity take place after the classroom has been disbanded. Once again it may be recommended that greatest emphasis be given to the objective characteristics of social action.

Concepts Used

In order to review concepts appearing in classroom interaction studies we have found it useful to assume an ideal-typic role model for classroom interaction. It may be assumed that classroom interaction takes place among an identifiable teacher and a group of pupils. Pupils may appear in either of two roles, as a group of passive audience members, or as individual targets who interact directly with the teacher. Teacher behavior may be dealt with separately, as may target (or audience) behavior; or interaction between the teacher and target may be studied as a unit. Finally, the classroom as a social system evidences an externally imposed structure, an internal structure, and a series of social functions. (That classrooms may evidence other forms of behavior than those suggested in this ideal-type model is clear. However, this model appears sufficient to handle the majority of concepts so far proposed by classroom investigators.)

Teacher performance. The majority of classroom studies reviewed have evidenced concepts for teacher performance. Although on first review the concepts utilized appear to cover an enormous, conceptual territory, in practice only three basic teacher characteristics appear to be dealt with. Some studies appear to be concerned with teacher actions, with concepts describing the immediately observable activities of the teacher. Among lists of teacher actions suggested, the following are examples:

Jackson	Flanders	Hughes	Perkins
Control pupil response	Accepts pupil's feelings	Controlling	Does not accept pupil's idea
Search for or stimulate pupil response	Gives praise	Imposition	Praises or encourages
Display educational materials	Accepts pupil's idea	Facilitation	Listens to, helps, supports
Refine "bad" responses	Asks a question	Content development	Accepts or uses pupil's idea
Stabilize "good" responses	Lectures, gives facts or ideas	Personal response	Asks questions about content
Plan future pupil responses	Gives directions	Positive affectivity	Asks questions that stimulate thinking
	Gives criticism	Negative affectivity	Lectures, gives facts or opinions
			Gives directions, commands, orders
			Criticizes or justifies authority

A second major focus of concepts for teacher performance is upon manners, the way in which teachers conduct their behavior. For instance, Ryans asked observers to rate the warmth, organization, and stimulation of teachers, while Kounin was concerned with the clarity, firmness, child *treatment*, *intensity*, *focus*, *over-lappingness*, and *with-it-ness* of teacher performance in deviancy control. The third recognizable focus has been upon teacher *characteristic roles*, in this use of the word, the relatively stable patterns of behavior exhibited by teachers in various classroom situations. Perkins, for example, recognizes the teachers as a *leader-director*, a *resource person*, a *supervisor*, a *socialization agent*, and an *evaluator*; while for Gump (unpublished) teachers may be watcher-helpers, *participators*, *action directors*, *recitation leaders*, *instructors*, *readers*, and *testors* (Kounin uses a similar list.)

The similarities and disparities among these various lists of concepts for describing teacher performance pose serious analytic questions. In the first place, there appears to be considerable conceptual overlap between items listed as actions, manners, and characteristic roles. Of perhaps greater significance, although most of these lists are claimed to be "exhaustive" of teacher performance, it is noteworthy that concepts for teacher performance found in one list are not necessarily to be found on other lists. And, more particularly for the role concepts, although some of the categories specified for teacher performance imply the existence of a given form of classroom interaction (viz., a "lecture", or a "test"), little effort has been given to the problem of analytically separating the various forms of classroom interaction from the more numerous forms of behavior teachers might play in them. These comments may be summarized by observing that although all of the studies reviewed have demonstrated reliability of their observational instruments, few of them report an attempt to analyze or theorize about the underlying conceptual structure that informs the category set used. Until such an analysis is provided the reviewer has little to go on when attempting to compare systems of concepts or when relating encoded teacher behavior with other classroom data.

Audience performance. Although theoretically audience members may also be expected to exhibit action, manner, and role characteristics in their performances, it is usually assumed by classroom investigators that the audience is both inactive and passive in comparison with the teacher. The inactivity of the audience implies that fewer action distinctions have been suggested for audience pupils than for the teacher. The passivity of the audience suggests that concepts pertaining to audiential role are more likely to reflect classroom structure (an independent variable) than pupil response (a dependent variable). Although this assumption is questioned in the paragraph below, we shall in fact review audiential role concepts in a later section as an aspect of classroom structure. Among recent investigators who have suggested concepts for audiential action, Perkins suggests that pupils may be *interested in ongoing work*, *reading or writing*, show *high activity or involvement*, may be *intent on work in another curricular area*, may be *intent on work of a nonacademic type*, may be *socially work-oriented*, may be *social or friendly*, or may be *withdrawn*; while Kowatrakul distinguishes pupils who are *intent on ongoing work*, *socially work-oriented*, *social-friendly*, *mementarily withdrawn*, *intent on work in another academic area*, and *intent on work in a nonacademic area*. Turning to audience manner, we find that Ryans rated the alertness, responsibility, confidence, and initiation shown by pupils; while Medley and Mitzel provided categories of participation, interest, order-seeking, and classroom order; and Kounin rated pupils as they were involved in work, not involved in work, restless, languishing, and engaged in task-related or non-task-related deviancy.

The basic criticism made of concepts for teacher performance may also be made of concepts used for the audience. The concepts proposed appear to represent a miscellany of intuitively based distinctions. Few investigators have provided a discussion of the underlying conceptual structure that informs the set of concepts used. Again, the fact that the audience is usually composed of a group of pupils poses additional problems. For one, it is perfectly possible for dependent variable phenomena to appear at the collective level in the audiential group. Audiences may become "cohesive," for instance, or "behavioral contagion" may occur within the audience. Interestingly, the bulk of concepts used to date for audience characteristics are individual rather than collective in their orientation. A second problem concerns the handling of audience members who deviate from the majority behavior pattern. In recent classroom studies this problem has been solved in two ways. Some investigators (for instance Kowatrakul, Sears, and Perkins) have rated the behaviors of individual, audience pupils. Most studies, however, have called for a rating to be given to the audiential majority.

Target performance. Although target pupils are both easy to recognize and generally more active than members of the audience, few concepts have as yet been proposed by classroom investigators for target behavior. Presumably this stems from the fact that identification of the target pupil is evanescent and shifts with changes in the teacher's attention. Concepts used have also tended to be quite general. Flanders, for instance, discriminates between target _response_ and _initiation_; Waimon and Hermanozicz encode the _adequacy_ and _magnitude_ of the target pupil's response to the teacher; while Gnagey, in a study supervised by Kounin, studied the _power_ and _reaction to deviancy control_ of target pupils. It is evident that many additional characteristics of targets may in fact be observed. L. M. Smith and Geoffrey, for instance, suggest that there are sharp personality differences in the behaviors of target pupils; and that characteristic target roles may be observed in the stable classroom. However, the majority of investigators to date have considered target behavior within the context of teacher-target interaction.

Teacher-target interaction. Within the past five years several teams of investigators have turned serious attention to the analysis of teacher-target interaction. The majority of these studies have turned away from static models of teacher or pupil behavior and have focused instead upon the interactive sequence of moves. Since various types of sequences may be analyzed (for instance, sequences initiated by the teacher versus sequences initiated by a pupil), such analyses have usually involved the suggesting of models and the restriction of interest to only those sequences that meet the models prescribed. Three such models appear in the literature.

Language models appear in the work of B. O. Smith, Nuthall and Lawrence and Taba et al. Sequences of such a model generally begin with an initiating move by the teacher. They are then continued by the target pupil, may or may not contain additional teacher-target interaction, and are terminated either by teacher comment or by a change of the subject matter. Smith offers various systems for classifying such sequences. (For instance, reciprocating episodes may define, describe, designate, state, report, evaluate, etc.; explanatory episodes may be causal, normative, or teological; teaching ventures may be causal, conceptual, evaluative, informatory, and the like; and moves themselves may have a variety of functions within the overarching sequencive unit.) Nuthall and Lawrence offer a classification of the moves teacher may make when initiating the sequence (comments, questions, permissions, responses, requests, etc.), a classification of target responses (responses, requests, comments, etc.), and a classification of methods of terminating the sequence (comments by teacher, no comment, repetition of response, etc.) Taba et al rated sequences for their designation (whether the source was a teacher or a pupil and whether information was sought or given), function (whether the unit related to management or involved content), and level (the relative concreteness or abstraction of the unit); and dealt with various cognitive tasks including those of grouping and labeling, interpreting and making inferences, and predicting consequences.

Learning models have been suggested in the work of both Waimon and Hermanozicz and Nuthall and Lawrence. In such models one examines a sequence which begins with behavior by the target pupil. This is then acted upon by a teacher stimulus and the effectiveness of that stimulus is judged in terms of changes in the target behavior. Waimon and Hermanozicz, for instance, suggest that the teacher may provide drive, cue, and reward for the pupil and suggest that the moves of the teacher may be those of _activating_, _maintaining_, _informing_, _cuing_, _reacting informing_, _reacting cuing_, and _positive_, _negative_, or _neutral rating_.

Decision-making models have not yet been applied directly to the encoding of teacher-target interaction, although L. M. Smith and Geoffrey suggest that such a model is probably a more adequate basis for understanding than either the language or learning model. In such a model concepts would be encoded to express the problems teachers (and pupils) must overcome in dealing with their collective, classroom world. Smith and Geoffrey suggest a branching model for interactive sequences in which each move opens up new possibilities for continued interaction.

Flexible models -- We have suggested in an earlier section that interactive sequences may be analyzed to check any of a variety of models provided only that sufficient detail is encoded regarding the moves of teachers and targets in the classroom. The best example of such coding to date may be found in Bellack _et al_ in which interactive moves are coded for the _speaker_ (teacher, pupil, or device), _type of move_ (structuring, soliciting, responding, reacting), _substantive meaning_, _substantive-logical meaning_ (defining, fact stating, explaining, opining, etc.), _instructional meaning_ (assignment, material, person, procedure, etc.), and instructional-logical meaning. Although Bellack et al are also interested in interactive sequences, their work differs from that of, for instance, B. O. Smith in that sequence types are constructed rather than anticipated. However, it should be noted that the code categories developed have reflected both the limited subject matter task offered by the investigators to subjects, and the investigators' concern with "meaning" to the exclusion of manner, reinforcement, or decision-making.

Externally imposed structure. Various characteristics of the environment in which a classroom is imbedded may impose upon the classroom, and examples may be found in which these restraints have appeared in codes for classroom processes. It is possible, for instance, to discriminate the academic subject matters with which a teacher deals (see B. O. Smith, Nuthall and Lawrence, Hughes, Gump, and Kounin). It is also possible to recognize a variety of non-subject performances that are imposed by administrative regulation or educational ideology such as "sharing time," "show and tell," "milk money time," and the like (see Gump and Kounin). However, such impositions often make their effects on the classroom by subtle means and are not readily observable. L. M. Smith and Geoffrey, for instance, speak of such environmental constraints as the curricular and other rules, the physical conditions of the classroom, the personalities and predilictions of superiors, and the beliefs, values, and norms of the faculty, pupil clique, and parents. Whether such phenomena can be found to have observable concommitants in the classroom is moot; some certainly do but may only be studied when one is willing to collect data in a wide variety of schools and classrooms.

Internal structure. Various structural components of the classroom have been studied within the past few years. Concepts for classroom structure may conveniently be split into five headings.

Communication structure concerns itself with the fact that classrooms may from time to time be broken into more than a single communicating group. Some pupils may be doing seat work, for instance, or two or three pupils may hold a whispered conversation to which others are not privy, or the teacher may set up a work-group while she works with individual pupils in recitation. Communication structure has been studied by Gump, who discriminates between class _together_, _private_, _free_ or _sectioned_, and by Kounin, who codes group configuration.

Ecological structure deals both with the relationships among the bodies of the classroom participants and their proximity to and use of the physical properties that are found in the classroom. Kounin, for instance, has developed a location code for classroom actors. With one exception, (Bellack _et al_, who recognizes emissions from a non-human source such as a television set or blackboard), no investigator has, to our knowledge, studied systematically the ecological effects of chalk, pencils, model airplanes, or other material phenomena in the classroom.

Activity structure concerns the characteristic mode of activity that involves classroom members. Strangely enough, although words for classroom activity structures are common enough (viz; "lecture," "discussion," etc.) these concepts have rarely been applied to classroom observation studies. Apparently they simply do not apply reliably to observable patterns of classroom activity. B. O. Smith distinguishes between monologues and dialogues; and, as has previously been suggested, classroom activity structures are implied in the characteristic role concepts suggested by Gump and Kounin. Flanders suggests a classification of activities into administration, evaluation, new material, teacher-pupil planning, other class discussion, and seat work; while Perkins suggests large-group discussion, class recitation, individual work or project, seat work, small-group or committee work, and oral reports. It would appear that many of these activity concepts overlap with those pertaining to communication structure and characteristic role. To date no comprehensive conceptualizing of classroom activities has been undertaken. We presume that activity conceptualizations will have to be analytic in character.

Characteristic roles are the stable patterns of behavior that are evidenced by classroom actors within classroom activity structures. During a lecture, for instance, the teacher (or a pupil) may either be the lecturer or a member of the audience. A discussion allows various roles to be performed, such as those of ideational leader, emotional leader, etc. (see Bales, 1958). During seat-work the teacher may sit quietly at her own desk, or may walk up and down the aisle, or may hold intense discussions with selected pupils, etc. Characteristic roles for the teacher have already been reviewed. Such roles may also be conceptualized for pupils as a group or for individual pupils. Kowatrakul suggested that pupil may be involved in seat work, may be watching and listening, or may be discussing; for Perkins, pupil roles were those of large-group discussion, class recitation, individual *work or project*, *seat work*, *small-group or committee work*, and *oral report*; while Gump discriminated intake (*own* or *class* materials, *active* or *passive*), *draw, make or do*, *sing, chant, or play musical instruments*, *large muscle activity*, and *readying*. Individual pupil roles have been suggested by L. M. Smith and Geoffrey who suggest that individuals in the classroom are seduced into certain classroom roles such as "clown," "patsy," "butt," and the like -- roles which persist through the class year, which appear as a result of teaching strategies and individual needs, and which color the effects of instruction for the pupils involved.

Social functions. Although observations of the "outcomes" of social behavior are necessarily at a high level of abstraction, it is possible to observe social functions in the classroom. At least four types of social function are dealt with in recent studies. *Content* deals with classifications for the subject matter with which the classroom (or its sub-groups) may be communicating. Conventionally, this is interpreted in terms of the traditional, schedule defined subjects. *Mode* expresses the form of communication. For instance, Jackson has suggested a classification system involving *instruction*, *group management*, and *classroom control*. *Phases* of the classroom system may also be recognized; for instance, Gump discriminates *preparations*, *consummations*, and *evaluations*. Finally, another type of social function is suggested by the concept of *classroom culture*. Various commentators, notably Videbeck (1965) and L. M. Smith and Geoffrey, have noted that much teaching activity is devoted to the creation of shared norms, values, or beliefs, which are created early in the class year, and which constitute a base for subsequent social interaction. Smith and Geoffrey, for instance, make the point that teachers in slum schools often cannot count on middle-class achievement motives in pupils and must create appropriate classroom norms before even minimal instruction can take place. It should be possible to make inferential observations about classroom culture, although no investigator has apparently attempted this task empirically.

Discussion. It is clear that a striking range of concepts has already been used for the observation of classroom phenomena. It is equally clear that most conceptual systems developed not only reflect a lack of analysis or theory about their underlying conceptual structures, but they also generally fail to recognize the existence of other types of concepts. As a result, attempts to synthesize the joint implications of these systems is difficult. This does not mean that one cannot recognize families of concepts nor choose among those families concepts which are of greater utility for specific research purposes. For instance, the relatively static concepts of teacher and target performance are probably less useful than that of teacher-target interaction. Among interaction concepts, it would appear that the extensive coding of interactive moves combined with the analysis of verbal and other components of those moves and the analytic reconstruction of behavioral sequences by computer analysis holds the great promise. Audiential characteristics (in reaction to interactive moves) may be judged regardless of the interactive unit chosen. At a higher level of abstraction, structural and functional properties of the classroom constitute the enfolding environment which both enables and is affected by teacher-pupil interaction. Thus, the "ideal" system of analysis should consist of at least: (a) a set of concepts for interactive moves including both overt action and audiential reaction, (b) a set of concepts pertaining to structural and functional properties of the classroom system, and (c) a set of concepts for linguistic analysis.

A Revised Model for Classroom Analysis

If the implications drawn during the review are carried to their logical conclusions, it should be possible to arrive at a model of classroom interaction that is both comprehensive and coherent. Ideally, such a model would accomodate all the concepts already formulated, the conceptual postures adopted and the theoretical positions taken. More,it would extend these so that categories of concepts were logically complete, conceptual postures were mutually complimentary and theoretical positions harmoniously reconciled. However, at this stage in classroom research such an ideal is worthy but not yet achievable. But some systematization is possible, and in the section that follows a comprehensive model for classroom behavior analysis is put forward. The model is based on the conclusions reached during the review. It accomodates most of the earlier attempts at conceptualization and it is operational. It represents the author's judgment of what constitutes the major and basic conceptual issues that have to be dealt with in arriving at a general comprehensive model. The expository portions of this section are divided into three parts: concepts for social environments in the classroom or *contexts*, concepts for activities of pupils and teachers or acts, and concepts for units of symbolic meaning or words. The restriction of attention to concepts of these three generic classifications requires some justification.

As a social system, the classroom presents us with a variety of characteristic features and a number of problems. Generally it may be assumed: that the classroom is composed of representatives of only two positions (one teacher and a number of pupils); that these persons are initially strangers to one another but come to know one another as individuals; that the teacher has both power and responsibilities with respect to pupils and that the latter are minors; that it is conducted within an enclosed room having both fixed and movable physical equipment; that the participants maintain and operate this physical environment; that the class meets at regular times of the day, week, and semester; that much of the symbolic exchange taking place is "public" in the sense that all participants may be aware of it; that it is constrained by various values (particularly "instruction") and norms (particularly "quiet") that are imposed on it from the institution in which it is imbedded.

The classroom also poses other problems for the behavioral analyst. One or more communicating groups may be assembled within the classroom; communication roles may either be adopted characteristically by teachers and pupils or may shift with the appearance of new classroom events; the event structure of the class hour is neither standardized nor adequately conceptualized by classroom participants; a unique classroom culture is built up over time, and classroom events are often organized in terms of the beliefs, norms, or values of that culture; and classrooms are enormously variable in the conditions which effect them and in their results.

The greatest difficulty facing the encoder of classroom events is his choice of unit for coding. Several issues are involved in this choice. One is the problem of whether to code events occurring within the macro-system of the classroom as a whole, the medial-system of the behaviors of selected units, or the micro-system of such behavioral components as individual words. Another problem is the length of coding units -- short units allow for maximal flexibility in the analysis procedure while longer units provide for greater internal treatment and insight. Still another is the problem of coding versus concept construction -- some classroom characteristics are best coded directly while others are best identified from patterns of previously coded materials.

As will be seen below, we have attempted to solve these problems by recognizing concepts at each of three levels of molarity and by providing a variety of conceptual distinctions at each level. We turn first to the discussion of concepts for contexts.

Context Concepts

We begin the discussion of context concepts by taking up the larger, phenomenally concrete contextual events that may be recognized in the classroom hour or day. We then turn to smaller, abstract structural events and conclude the presentation with a discussion of classroom functioning.

Phenomenal events. Particularly in the primary classroom, the school day is generally broken into a series of events that are given standardized designations and are recognized easily by all participants. Many of these events are prescribed by the school curricula or other sources outside of the classroom itself -- academic subject matters, the morning pledge of allegiance, "show and tell," "milk money time," and the like. Others may come to be institutionalized through the habits of the teacher or, less often, through the importuning of an occasional pupil or pupil clique. One thinks in this latter context of the teacher who "always" terminates lessons early in the afternoon to have a private "story hour." Still other phenomenal events are aperiodic within the school year, such as parties, plays, contests, and other special events. The common characteristics of all these event types is that they are designated and recognized by all classroom participants -- hence concrete in character. Of necessity, any listing of concrete phenomenal events must be ad hoc in character, although it is always possible to analyze a given list in functional terms. In order to obtain such a list it is necessary to interview classroom participants, but to the educationally indoctrinated classroom observer such events are usually "self-evident." (At the secondary level, of course, classrooms are usually self-contained entities, and the classroom is often but a single, phenomenal event.)

Analytic structure. It is possible, of course, to make many more structural distinctions for the classroom than are recognized by classroom participants. The choice of such concepts is an arbitrary one, but of course the classroom analyst hopes that the concepts he chooses are conceptually independent of other concepts, reliably codable, and predictive of other classroom and related events. We have found it useful to discriminate several classes of structural concepts. Communication structure concerns itself with the fact that classrooms may form one, two, or more communicating groups. Some sub-groups within the classroom may be set up by the teacher, for instance when the class is broken into "teams," or one group is preparing the lesson while another group works on model airplanes. Other sub-groups may form through pupil action, as when two pupils are whispering together in a corner of the room. Several facets of communication structure may be coded: the absolute number of groups, the number of persons involved in each, their positional membership (or personal membership for mature classrooms). In our investigations to date we have limited coverage to but three sub-groups for a given classroom plus a residual category for "non-involved" persons. As a matter of fact, in classrooms so far investigated approximately one-half of the time there was but one communicating group present.

Another useful analytic concept is that of ecological structure, the relationships among the bodies of the classroom participants and their proximity to and use of the physical environment. Again, several facets of ecological structure may be coded: the locations of the bodies of classroom participants within the box of the classroom, the directions in which their bodies and faces are pointing, their usage of the fixed and movable props available. (Whereas provision of props -- educational media for instance -- may be a structural condition imposed on the classroom, usage of that prop forms part of the ecological structure. A chalkboard, for instance, may be used for communicative emphasis or for punishment.)

Still another analytic concept is that of transitory role. As used here, a role consists of a stable pattern of behavior observable and characteristic of an actor in the classroom (see Biddle and Thomas, 1966). To make such a definition does not tell us how long a pattern of behavior must be stable in order to be considered a role nor how to choose content categories for encoding roles. At one end of the scale a role becomes indistinguishable from individual behavior and should be coded as a series of acts. At the other end of the scale, it is possible to distinguish "styles" of behavior characteristic of the teacher or pupil throughout the classroom semester. To be useful at the context level a role must be judged in units that are coterminus with context units and should be encoded in content terms that bear relationship to the defining characteristic of the context. It is possible, for instance, to recognize transitory roles for phenomenal events, communication structures, or ecological structures. Within "show and tell" the teacher is characteristically an encourager while pupils take their turns speaking out. Within communication sub-groups in the classroom one may recognize the roles of initiator, respondent, and audience. A chalkboard provides various roles for classroom participants including those of writing upon it, reading from it, reciting from it, cleaning it, scratching one's fingernail along it, and so on. Providing only that classroom behaviors are sufficiently stable to form a discriminable context, it is also possible to discover differentiated behavior within those stable contexts -- or transitory roles.

The problem of characteristic roles -- patterns of behavior uniquely exhibited by classroom individuals -- is probably best left to constructed analysis (as opposed to direct encoding). Provided that detailed records are kept of the transitory roles and individual acts emitted by pupils and teachers, it is but a matter of analysis to discover that the patterning of individuals' behavior is different from another, either throughout the range of classroom contexts or uniquely in specific contexts. In fact, a complex constructed typology of characteristic roles may be provided for either pupils or teachers provided only that sufficiently differentiated information is available from the act and transitory role codes. (We shall return to this subject in the discussion of a typology of classrooms below.)

A similar treatment should also be given to the concept of activity structure -- or characteristic mode of activity that involved classroom members. While it is possible to develop an analytic list of classroom activities for direct encoding, this process would appear to overlap with other coding activities already discussed. Consider: (a) The activity concept develops historically from that of the phenomenal event, although the latter are concrete events recognized by classroom participants. (b) As suggested in our earlier review, common designations for activities (viz., "discussion," "lecture," and the like) turn out to be ideal types that are but poorly represented in actual classroom behavior. (c) The activity structures proposed by investigators to date turn out to be but selected structural or functional conditions assumed to obtain "characteristically" in the classroom. Monologues and dialogues differ in the transitory roles of teacher and pupils. Seat work involves both an ecological structure and a transitory role. Large-group discussion is a communication structure variety, etc., etc. These observations suggest strongly that a typology of activity structures should be developed from the constructed analysis of classroom contexts coded in other terms -- and that an appropriate list of classroom activities will probably recognize various contextual states not now recognized by investigators.

Analytic function. Whereas the analytic concept of structure deals with how behavior is being performed, function deals with direction or outcome of social behavior. The encoding of functions is necessarily more abstract than the encoding of structures, for the latter require only a single observation of behavior. A great deal of nonsense has been written about "functionalism," most of it reifying or refuting the teleological fallacy of assigning motivation, recognition, or intention to the participants in a social system for which we must judge a function. It is our intention here to restrict function to its minimal meaning -- that of a judgment by the observer of directionality over time in the pattern of behavior observed.

As with structures, it is possible to make many more functional distinctions for the classroom than are recognized by classroom participants; and the choice of functional concepts is equally arbitrary. Again, we have chosen to discriminate several classes of functional concepts. Content deals with the classifications for subject matter with which the classroom (or its sub-groups) may be communicating. Actually content, like role, may be discriminated in very short or quite lengthy units. A communicative act usually has a unique content, and we shall discuss the encoding of content at this level below. A class hour also has a content. But midway between these two levels contextual-length units of content may be discriminated at one or more levels of molarity. The investigators have discriminated, for instance, among the assigned subject matter, non-assigned subject matter, socialization, and management-organization as major topics of classroom communication. Similar but not identical distinctions are suggested in the works of Bellack _et al_ and B. O. Smith.* The further development of such content distinctions depends upon additional analyses of the possible outcomes of classroom activity.

Another functional distinction, _mode_, deals with the form of communication. The investigators have discriminated, for instance, between "operation" (ritualistic, or practice activities in which no information is exchanged), "information dissemination"(transmission of knowledge), and "intellectualization" (explanation or understanding of knowledge). Jackson has suggested a similar but not identical classification. As in the case of content, the concept of mode becomes useful only if it represents a stable condition of the classroom or its sub-groups to be encoded over time. Mode-like characteristics of acts may also be coded (see below). Again, we assume that further development of the mode concept will occur.

The encoding of classroom _phases_ may also be attempted. Gump suggests that preparations, consummations, and evaluations may be recognized. Other more content oriented categories such as: the appearance of new material, the assigning of homework, and the like appear in the works of Flanders, Perkins, and Bellack _et al_. The difficulty with most phaseological concepts is that they presuppose analytic integration on the part of the investigator. It is patent that the class hour begins, operates, and then concludes -- as do shorter units of classroom activity. By coding "phases" of these units are we not in fact anticipating the results of structural analysis? It may tentatively be concluded that the analysis of phases be carried out through analytic construction.

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*References without date appear in the "Substantive References section of Appendix B.

Another potential source of functional concepts is that of classroom culture -- the set of shared norms, values, or beliefs which are unique to the classroom and which constitute a base for social interaction. Some aspects of classroom culture simply constitute a source of communication content, while others form standing patterns of contextual activity. Consider forms of humor, for example. Puns, sarcasm, or ridicule may form part of the shared culture of a classroom and may constitute recognizable contexts in which behaviors are organized. Other classrooms may exhibit their own slang, rhyming games, bigotries, banter, and other ways of amusing the troops. In still other classrooms periods of interest, gloom, warmth and rejection may be institutionalized.

The fact that functional concepts for the classroom are not as well worked out as structural concepts reflects a variety of factors -- the fact that functional concepts are at a higher level of abstraction, a general lack of functional words in the language, and the need for tying functional concepts at the context and act level together. Given that much classroom activity constitutes a meaningful exchange of symbolic acts, the majority of functional units must also form meaningful cycles of act units. Let us, in fact, designate the unit so created the functional episode. It is likely, of course, that various types of functional episodes may be recognized depending on the functional content with which one is concerned. B. O. Smith suggests functional episodes of various lengths: (a) those dealing with a single subject matter, (b) those attaining certain results and guarding against others, and (c) those dealing with a single overarching content objective. Others may be suggested from the mode and culture concepts reviewed above.

(The close tie between functional units and the cycle of public classroom acts need not hold for structural concepts at all. It is quite possible for a teacher, for instance, to alter his position in the classroom or change his usage of communications media while continuing in pursuit of a simple point. While functional episodes must be defined in terms of act cycles, structural episodes are defined independently of acts. This does not preclude our discovering relationships between act forms and structural conditions, of course.)

Act Concepts

Although it is perfectly feasible to code the acts of any classroom member, it is in fact useful to code only public acts. Non-public acts can have effects only on the limited numbers of persons who witness them while public acts are both intended for and are generally witnessed by the majority of classroom members. There is some evidence to suggest that in the vast majority of cases public acts form a single sequence of events to which the majority of the classroom members are exposed. It is codes for this sequence of act events we wish now to discuss.

It is also true that most of the public acts of the classroom have a symbolic component. Symbolic acts are those whose meaning is determined by the artificial references of spoken or written speech, and of course much of the content of educational discourse concerns the manipulation and meaning of symbols. It is also true, however, that some acts of the public sequence are non-symbolic in nature (for instance, "ouch"), and we shall discuss their encoding shortly.

Generally we have found it useful to discriminate four act concept classes: the speaker, transitive forms, referential material, and act functions.

The speaker. It is obvious that the emitter of an act must have an identity -- although in some cases the emitter of a particular act may be unclear either to the observer or to some classroom participants. Some speakers are mechanical, for instance, a television set. If a person, the speaker may be identified by position, whether he is a pupil or the teacher. In time, however, members of the classroom become known to one another both in terms of the characteristic roles they emit and as individuals. Minimally, then, an act is associated with "John," or "Mary," or "Miss Jones."

Transitive form. All symbolic utterances exhibit a transitive form, a formal property by which the major divisions of utterances are differentiated from one another.[1] Major transitive divisions are those which separate assertions from questions, demands, exclamations, and the like. Depending on the degree of refinement desired, additional, formal characteristics of language may be recognized in the coding of transitive forms. To carry this process to its reasonable extreme, the encoding of transitive forms becomes the analysis of syntax (see Chomsky, 1965). However, to provide such an encoding for sizeable numbers of acts (the average class hour exhibits more than a thousand public acts in sequence) is costly in the extreme. Reasonable first steps may be taken by concentrating on the major transitive divisions as suggested above.

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[1] The word, transitor, is a technical term in role theory (see Biddle and Thomas, 1966). Bellack *et al* refer to the same concept as "logical meaning."

Referential material. Symbolic utterances also exhibit referential materials -- in fact it is the presence of materials that are referenced by the use of arbitrary symbols which define a symbolic utterance. Depending on the transitive form, a variety of referential materials may appear. One frequently encountered form is that of *referential persons*. Classroom participants often talk about one another or about others who are not present. Referential persons may be identified either uniquely by their personal names ("Mary") or generically as members of a recognized social position ("your parents," "policemen," "the Principal"). Referential persons may also appear in various guises: *Object* persons are those whose characteristics (usually behavioral) are under discussion; *Sentient* persons are those to whom are attributed thoughts, motives, or other psychological processes; *Target* persons are those upon whom behavior falls, etc. Often a single utterance will contain the names or positions of several referential persons who appear in a variety of guises. In fact, the various ways in which referential persons are treated constitutes one of the major determinants of transitive form. Consider the teacher's demand, "John, close the window, please." But one referential person is mentioned; the transitive sequence exhibits one step from the speaker to the target person. Contrast this with the statement from a teenager, "My mother does not approve of what my friends think of the behavior of boys in our neighborhood." Three referential persons are cited (mother, friends, boys), and the transitive sequence is three steps long.

A second obvious reference characteristic is that of reference behavior. In the above examples several reference behaviors appeared (close the window, approve, think of, behavior of). It should be strongly pointed out that reference behavior is not the same as observed behavior. The fact that the teacher has demanded of John that he close the window does not tell us a thing about John's actual window-closing behavior. However reference behavior has one striking advantage over observed behavior; we know how to code its content! Consider the teacher who has (to the observer) a peculiar, nervous gesture. Should we bother to record instances of this event in seeking to understand classroom events; in short, are the pupils aware of it? If the pupils speak about it in the classroom, we may be certain that the gesture is concrete to them. By the same token, should Johnny subsequently close the window it is significant because the teacher had previously demanded that he do so. In another classroom should Johnny stand up quietly and close the classroom window with no notice taken by others in the classroom, we would be in doubt as to whether this was even a public act.

These observations suggest one of two rules governing the encoding of non-symbolic events in the classroom act sequence; non-symbolic events should be encoded if they are referenced in the public symbolic utterances of the classroom. This criterion is not sufficient, by the way. Some utterances (for instance, a belch) may provoke considerable reaction from others in the classroom even though they are not referenced. Consequently, we add a second rule; non-symbolic events should also be coded as public acts when they are presumably a pre-potent stimulus for the majority of classroom members. In the latter case, by the way, the observer is "on his own" with regard to the identification of appropriate content categories for the encoding of behavior. For example, given group singing by the classroom, is it pertinent to code that the group sang out of tune or "with vigor"? Unless the classroom members discuss these phenomena or there is some obvious "wincing" at a particularly bad note the observer has no way of knowing.

Reference behavior has a variety of properties that may be encoded. Some of these, such as *action* and *manner* components, have been reviewed in an earlier context. Reference behavior may also be *covert*, *contingent*, *goal-oriented*, or *inadvertent*. It may also occur in the past, the timeless present, or the future. All of these distinctions, and others, offer a variety of analytic facets that may or may not be coded for the utterance. Interestingly, whereas action and manner components may be coded for non-symbolic acts, most of the latter distinctions are in fact inferences made by the person who utters symbolic materials and are not directly observable in behavior itself.

In addition to reference persons and behavior various other reference materials appear in utterances which we shall refer to generally as content. Tools appear in content as well as physical and symbolic objects upon which action is taken. In family, business, or recreational discourse, normally the objects about which symbolic exchanges are organized are concrete entities. Classroom objects are more often abstract or are events that do not take place in the classroom itself. Often classroom discourse is involuted; it turns back upon itself analytically. Participants are called upon to examine the nature of the symbols they are using -- or the nature of nature! Given the enormous variety of content symbols that may appear in even a single hour of classroom discourse, analytic categories must be provided for content encoding. To the best of our knowledge [illegible] content encoding [illegible] system was designed merely to cover an arbitrary lesson (substantive content) presented by the researchers to the classrooms studied together with a classification of instructional materials (instructional content).

Communication mode. Although most classroom discourse is essentially verbal, it is quite possible for teachers to communicate symbolically with pupils by writing on the blackboard, by using visual aids, or by imperious gesture. Each of these act forms constitutes a communication mode and may be easily encoded.

Act functions. Human discourse tends toward the cryptic. Often the meaning of an act must be judged from its context. The neutrally delivered "yes" may provide assent, reward, permission, or humor depending on what has gone before. It is perfectly feasible to provide a set of functional categories for relating acts to the micro-context of other communications in which they are imbedded, and several investigators have sought means of doing so. Bellack et al, for instance, discriminate structuring, soliciting, responding, and reacting acts; Waimon and Hermanozicz encoded activating, maintaining, informing, cuing, reacting, and rating acts; B. O. Smith presents a variety of functional classifications, etc. The difficulty with many of these schemes is that they presuppose the very sequence of acts we shall presently be examining analytically. If a particular sequence of acts has meaning because of their peculiar sequential arrangement, then this meaning should theoretically be discoverable through appropriate analytic techniques. However, this is a counsel of perfection and would require the detailed coding of transitive, behavioral, and content information we have already rejected as being unwieldy. Thus, it appears that we are stuck for the present with some form of act function coding. Needless to say, functions chosen bear a working relationship both with the other codable aspects of acts and with the distinctions chosen for functional coding at the context level. It is likely, for instance, that certain contextual functions may restrict or specify the act functions that may appear within them. For instance, L. L. Smith and Geoffrey suggest that banter as a form of classroom humor may have an act-sequential form that is recognizable in the same sense the limerick or "knock-knock" has. B. O. Smith has probably done more work on the examination of such sequence forms than any other investigator.

Audiential reaction. Finally, although technically not a part of the act itself, it is possible to distinguish other classroom events occurring coincidentally with the emission of the act. Of these perhaps the most important is that of audience reaction. Although many audiential characteristics are given by context codes, momentary audience emissions (laughs, chatter, hand-waving, gasps and the like) may shift too rapidly for simple context coding. These form a background for act exchange in the same sense that larger contexts do. Various investigators have attempted audiential encoding, including Perkins, Kowatrakul, Kounin, and Gump. Generally, the schemes proposed have but few conceptual distinctions.

Summarizing: we have put forward six act concept-classes: the speaker, the transitive form, referential material, reference content, communication mode, act functions, and audiential reactions. We have also recommended that only the public act sequence of the classroom be coded and that coding be confined to symbolic acts unless the non-symbolic act was referenced symbolically or if it was presumably a prepotent stimulus for the majority of classroom members.

Word Concepts

In order to suggest concepts appropriate for the encoding of words it is necessary to turn to the field of linguistics. Generally, linguists study the system of verbal symbols with which human beings communicate directly using three, general domains of concepts: semantics (the study of meaning), phonology (the study of sounds), and syntax (the study of language forms and sequences). Of these three, the study of syntax is most relevant to classroom interaction since it is presumed that a complete grammar of syntactical rules would in fact enable us to generate both semantics and phonology.

In linguistic terms, it is reasonable to presume that what we have here called an act would be designated an *utterance*, while the syntactic rendering of an utterance is termed a *sentence*. (Except for a few isolated cases, linguistic attention focuses strictly on the verbal components of communication. For example, the pupil who waves his hand for attention would not be judged to have emitted an utterance in strictly linguistic terms, and the smile or frown with which a teacher delivers an admonishment has no verbal code. This suggests that from a strictly linguistic point of view, we must develop both verbal and non-verbal methods of coding classroom acts.) The syntactic analysis of classroom utterances depends on differentiating such elements as the *base* (the fundamental structure of the grammar) and its grammatical *categories* and *lexicon*, and the possible *transformations* (varieties) into which the base output may be deformed. To put it another way, whereas in the previous section we have put forward a number of concepts for coding the act as a wholistic unit of symbolic exchange, it is also possible to analyse the act (utterance) in terms of grammatical constructs partitioned into three main categories : syntax, phonology and semantics. Syntax gives the base structure of the grammar and provides the significant grammatical categories.

Such considerations provide us with a minimum of three ways in which words may be coded. First, words may be coded for the *grammatical categories* they represent. Second, words may be coded as lexical elements, that is as representative of vocabulary per se. Third, words may be coded for their phonological components. Let us examine each of these possibilities.

The coding of words in grammatical terms allows us to examine the formal properties of classroom discourse. In terms of monologic expression, this means that we can encode the grammatical components which, in order, constitute the structure of sentences. Of equal importance, we can also examine the grammatical structure of dialogues. For example, one often observes classroom utterances that are composed of apparent sentence fragments which obtain their "meaning" because in some fashion they are "completed" by other meanings that have gone before.

It is also reasonable to presume that the learning of vocabulary and the choice of lexicon are of educational significance. In some cases, as in the case of the English lesson, vocabulary may be taught by explicit instruction. But throughout classroom education it is reasonable to presume that pupils will continue to learn a wider vocabulary from their teachers. Thus lexical sophistication will be a direct measure of educational impact.

Finally, phonological analysis of words is also likely to be of significance in the classroom, although most teachers place less stress on the explicit discussion of phonology. For example, Loflin (in press a, b) has examined the phonology and syntax of English as spoken by urban Negroes and suggests that the rules of Negro speech are sufficiently different from those of white middle-class Americans so as to interfere with language acquisition and classroom communication.

The fact that we are recommending here that classroom words be coded in grammatical, lexical, and phonological terms does not mean that these are the only ways in which we can use linguistic insights in the study of classroom events. Take, for example, the problem of communicating by non-verbal symbols. Teachers will often write key words or phrases or illustrations on the blackboard. These will then be referenced in future interaction by gesture or by such referential terms as "that." Although written forms of symbolic exchange cannot have phonological components, they may certainly be coded for lexical and grammatical usage.

To our knowledge, no linguist has yet investigated classroom utterances directly. Several linguists have concerned themselves with the stratification of linguistic variables among persons in various social classes, notably Labov (1966). Additional, related discussions of sociolinguistics appear in Bright (1966), Gumperz and Hymes (1964), and Hymes (1964). Bernstein (1962, 1966) discusses language problems and social class in London schools in terms of linguistic variables. Other discussions of the learning of linguistic elements appear in Ardarova (1964), Bellugi and Brown (1964), Braine (1963), Brown and Bellugi (1964), Chomsky (1964), and Menyuk (1963a, b, 1964a, b).

Model Summary

Listed in Figure 3-3 are the major types and classes of concepts suggested in our revised model. It should be reiterated at this point that the model presented here is still a tentative one that we shall be continuing to revise during the course of our future research into classroom processing. The research already completed, the research reported here in this document, covers but a limited range of the concepts suggested in the revised model. Nevertheless, it is also true that the revised model itself covers but a limited range of concepts compared with those offered in the central, review section of the chapter. In short, in the revised model we have chosen among the universe of classroom concepts those we presume to be the most fruitful. Understanding of the model may be sharpened if we list those elements we have chosen to leave out.

As already suggested, we believe it to be most fruitful to study various aspects of the classroom through analytic construction -- particularly the characteristic roles of individuals, activity structures, classroom types, and the phases of the class hour. Consequently, primitive concepts for these phenomena are not in the model. It is also evident that we have "left out" most of the static concepts for encoding teacher, target, and audience behavior -- preferring rather to cover these as act characteristics or through analytic construction. It seems best to us to encode the sequence of public acts throughout the class hour, to assemble these acts into meaningful sequences which will also constitute the units for functional context, and to unitize and code separately the contexts generated by phenomenal events and classroom structure. In a similar fashion, it is also possible that certain act concepts may best be generated by analytic construction from a linguistic analysis of their component parts.

In Chapter IX we return to this revised model and utilize it as criterion against which the empirical research reported in this volume must be judged.

Context Concepts
- Phenomenal Events
- Analytic Structure
  - Communication Structure
  - Ecological Structure
  - Transitory Role
- Analytic Function
  - Content
  - Mode
- Classroom Culture

Act Concepts
- The Speaker
- Transitive Form
- Referential Material
  - Reference Persons
  - Reference Behavior
  - Reference Content
- Communication Mode
- Action Function
- Audiential Reaction

Word Concepts
- Grammatical Categories
- Lexical Elements
- Phonological Components

Figure 2-3. Summary of concept classes for the revised model.

Propositional Classes for the Model

An even better summary of the revised model may be gained by considering the classes of propositions that may be stated for it. Given the tentative nature of the model formal propositions should not be attempted at this time. Instead, we shall here discuss the various classes of propositions indicated by the model with but examplar propositions.

Internal processes. If the classroom is a social system it follows that the components of classroom behavior must be rationally related to one another. If the concepts suggested in our model have validity for understanding the classroom, they must exhibit a variety of effects and influences on one another. Given the complexity of the conceptual model it is not surprising that propositions for internal processes fall into a variety of sub-classes. Perhaps the simplest type of proposition details *coincidental* processes operative in the classroom. For example, certain types of contents may be necessary for, or facilitative of, certain acts or act sequences. Again, a given form of communication structure or transitory role may be more likely to appear with a given functional content or usage of the physical environment. Some coincidental propositions are nearly self-evident: usage of the chalkboard facilitates communication, communication about frogs is more likely when a frog is present for manual manipulation, raucous laughter makes intellectualization difficult, etc. Others are neither self-evident nor have we much information about them at present. What, for instance, are the relationships between functional contents and the transitory roles of teachers?

Another type of internal proposition concerns *micro-sequences* of events in the classroom. Neither word, act, nor content sequences are simply arbitrary strings of events. An act of a given type (for instance a teacher question) is more likely to be followed by an act of another type (for instance a pupil response) than by just "any old act." Similarly, classrooms may exhibit predictable sequences of functional or even structural units. It is also possible for acts to touch off contents or for contents to stimulate acts, etc. Let us assume, for instance, that much of the classroom environment is in fact under the control of the teacher. This implies that teacher environment-setting acts should be followed by predictable structural and functional contents.

Micro-sequences propositions may occur in various forms, and some of these forms are implied by theoretical positions that have been taken by investigators. As we have previously suggested, learning theory propositions in the classroom involve a micro-sequence in which the acts of a pupil are compared before and after the provision of a rewarding or punishing stimulus by the teacher. Similarly, if our concern is to discover the ways in which teacher's respond to the classroom environment, we should look at a sequence that begins with the teacher's act. It is possible also for micro-sequences of longer duration to occur. B. O. Smith, Bellack _et al._, and Nuthall and Lawrence have examined act sequences of considerable duration that are tied together by a common theme, subject matter, or teacher strategy. Other more lengthy sequences may be generated by humor, by the necessities of social control or environmental maintenance, or by the idiosyncratic motives of individual classroom members. Finally, we have also suggested that micro-sequences may exhibit a phaseology in their own right. Classrooms, functional contexts, and even structural units may exhibit an act structure at their initiation that is distinct from acts emitted during their maturity or decline.

Micro-sequence propositions are related to but distinct from those of the _macro-sequence_ of the classroom semester. Given the periodic and regular assembly of the classroom social system, it is reasonable to presume that unique cultural elements appear within each classroom over time. In part these should consist of a backlog of reference content materials that have previously been discussed. In part, also, most classrooms build up a set of unique norms and values for conduct which are used through the latter part of the semester for mutual control. L. M. Smith and Geoffrey have suggested that this latter process is particularly important in the lower-class classroom where pupils bring fewer norms favoring academic achievement and behavioral control than is true in the middle-class neighborhood. If their assumption is correct, teachers of the lower-class school who cannot set effective norms in these areas early in the semester will also doom themselves to frustration in their attempts to carry out classroom instruction.

If as suggested here the internal processes of the classroom are rational and may be expressed as a series of coincidental and sequential propositions, we may well ask whether there are not a limited number of ways in which successful classroom education may be conducted. To form a catalogue of ideal *classroom types* would certainly help our understanding and teaching about the classroom. It is possible, for instance, that one classroom may be "chaotic and excitable," another "Socratic," and still another "dull and torpid." If, as has been suggested, teacher acts touch off classroom atmospheres, and those atmospheres in turn facilitate teacher behaviors, it is distinctly possible that there exists but a limited number of stable forms in which classroom activities can be prosecuted. Such stable forms would, of course, exhibit both characteristic roles for classroom participants and stable forms of linguistic phenomena, acts, contexts, and word-, act-, and context-sequences. Even if the identification of discrete ideal classroom types is not possible, it should be possible to identify the major dimensions along which classrooms vary from one another by factor analysis or other appropriate analytic means. Needless to say, in order to do this it will be necessary to collect data from a large number of classrooms on the order of complexity of the model suggested here.

The causes of classroom events. A second type of proposition pertaining to the model is that dealing with the relationship between classroom events and those independent variable factors which cause classrooms to differ from one another. How is classroom behavior affected, for instance, by subject matter, by pupil age and grade, by the use of training aids, by the personality of the teacher? Before taking up the various types of independent variables that may affect a classroom it is worthwhile noting that *any* codable or analytically constructed process operating in the classroom is fair game for such effects. Words, acts or contents may be affected, or their sequences, or their coincidental occurrence. Whether or not these effects relate to desired educational outcomes is another issue (see below). But any empirically identifiable aspect of classroom behavior may be examined as a dependent variable when seeking to establish the causes of classroom events.

For convenience, it may be assumed that the independent variables affecting the classroom may be sorted into three groups. First are those variables stemming from the *teacher*, such as the teacher's sex, age, training, personality, appearance, mannerisms, educational experience. Second are variables associated with the group of *pupils* who are also found in the classroom, their social class, intelligence, ethnic background, previous educational experience, personality, family background, residence history. Finally, classrooms are also affected by a number of *structural* variables -- conditions imposed on the classroom by the rules or traditions of education and school or by the physical environment, such as grade-level, subject matter, size of the class and crowding, the presence and use of educational media, regulations pertaining to the curriculum, time of day, arrangement of seats, and physical conditions affecting light, heat, and sound. In this model it is assumed that the classroom represents a unique coming together of teacher, pupil, and structural requirements; and to the extent that classrooms differ from one another their differences may be assigned to combinations of these factors.

Actually most of these factors are phenotypic with respect to classroom processes, and discussions of their probable effects on classroom behavior must rest on a genotypic analysis of their meaning for the classroom. For instance, consider the independent variable of pupil social class. Social class differences suggest a variety of factors which are likely to affect the classroom. For one thing, lower-class pupils are less adequately socialized in the achievement and control norms of the society; for another they are likely to be drawn from ethnic and racial minority groups with all the problems that segregation and bigotry bring; for still another they are apt to come from broken homes with little parental supervision or interest in their schooling. They will also have fewer artifacts to bring to the school, a higher rate of absenteeism and earlier pregnancies, greater need for the funds that school drop-out provides. In addition, teachers of lower-class pupils are not likely to come from or now live in lower-class homes themselves, and there is a tendency in many school districts for the most promising teachers to be sent to middle-class schools and for the provision of fewer facilities in "slum" schools. Thus, the apparently simple phenotypic variable of pupil social class is likely to have multitudinous effects on the classroom because it is in fact a bundle of many, associated variables.

While it is implicit in the model presented, stress should also be laid on the presumed interaction of independent variables in affecting the classroom. One teacher may have an excellent style for mathematics and be quite ineffectual at teaching social studies. The social class background of the teacher may make no difference at all to middle-class pupils, but the teacher whose background is lower-class may have unique insights about lower-class pupils. Teaching machines may have differential effects on the classroom depending on the subject matter taught, the grade level, and the interests and motivations of pupils. Once upon a time it was assumed that the "competent" teacher had unique qualities which would insure success regardless of the classroom taught. The model set forth here explicitly assumes that the teacher is but one ingredient in a complex potpourri of factors affecting the classroom, and that "excellence" in education results from the fortuitous marriage of many causitive factors, among which teacher behavior is but one.

The effects of classroom events. Interestingly enough, despite the sophistication of hortative theory dealing with desirable educational goals, the classroom researcher today has few tools for measuring the effects of classroom events. Contemporary ideology stresses that education should produce citizenship, motivation for additional education, a decent respect for the rights of others, ability to know one's own needs, creativity, and many other diffuse goals; while our measures of pupil growth are still largely confined to the annual administration of instruments measuring reading, writing, and other basic skills. Achievement tests reflect, of course, an alter ideology for education. But in part, too, we are confused about how to measure pupil growth because we have not taken time to examine the actual functions of classroom processes -- the effects of classroom events on pupil (and teacher!) participants.

Let us take up this challenge and speculate briefly about what types of things the pupil might learn from classroom events, given the model of classroom activities presented here. One of the most obvious things he may learn is roles -- both transitory roles that are appropriate for behavior are recognizable social situations and characteristic roles that have been rewarded in the classroom. (Moreover, he must not only learn his own role but also that of counter-positions, such as the teacher's role.) It is almost certain that he will learn "some" educational content, although he may learn it in the context of doing or parroting rather than in an intellectualizing sense. And in many classrooms he will learn a variety of unique, cultural elements that originally pertained to the classroom itself but may be generalized to other situations -- norms, beliefs, values, sanctioning systems and the like (see Videbeck, 1965). If phases of the classroom or of its sub-units (such as functional episodes) appear, he must almost certainly learn to play an appropriate part in these "games." Finally, he will learn -- as do all pupils -- to recognize various classroom "types," to react appropriately to their stimuli and eventually to manipulate them for his own purposes.

Some of these "learnings" may appear strange to the reader; they certainly do not sound much like the strictures of contemporary educational goals. And yet, many of these learnings must form the bases for whatever citizenship, self-motivation, respect for the rights of others, and the like are in fact learned in the classroom context. The point to be raised is that once we begin to look directly at the processes of education actually taking place in the classroom we may also then speak realistically of the development of instruments with which to test the effects of classroom processes upon classroom participants. Videbeck (1963), for instance, sets forth a series of propositions that may be tested once we have developed means for assessing the norms learned.

What, then, are the "effects" of classroom behavior? Which classroom events are "effective" in altering the learnings, motives, and attitudes of pupils, and which are insignificantly relatable to pupil growth? The answers to these questions depend both on our looking directly at classroom behavior and our development of new instruments for measuring the many possible outcomes of educational processes. We have no doubt whatsoever that effective and ineffective classroom practices may be discriminated; indeed some of the latter may be rejected out of hand. But we are today a long way from adequately conceptualizing and measuring the effects of classroom behavior.

CHAPTER III

CONCEPTS USED IN THE RESEARCH PROJECT

The purpose of this chapter is to present a detailed review of the concepts that were developed and operationalized in the research project reported here. Since our empirical investigations were of classroom activities, the concepts reported are those we have found useful for expressing characteristics of classroom activities. Whereas Chapter II concerned itself with the widest possible range of concepts and with a general model for classroom analysis, this chapter reports only those concepts we have operationalized in our research on classroom activities to date.

The chapter is divided into four major sections. We first discuss briefly the concept of classroom activity. Next, concepts and codes for activity structure are presented. We then turn to concepts and codes for activity function. Finally, our strategy with regard to the analysis of activity episodes is discussed.

Classroom Activity in Perspective

A classroom is a behavior setting. Its personnel normally comprise a teacher and a number of students. Its artifacts, which may vary from chalk to cheese, are mainly relevant to the processes (teaching and learning) presumed to be going on within it. These processes involve interaction and communication among the individuals who comprise the cadre of the classroom. The express purposes of classroom activity are many, but tend to stress the changing of the behavior of the individuals who constitute the majority group (pupils), specifically in the areas of meanings, norms, and values.

The classroom as a behavior setting has unique qualities that distinguish it from other social groups. The members of its "society" live but part of their lives therein. Within its confines they neither seek nor get full and complete satisfaction of all their spiritual and temporal needs. They are constrained to be members either because as teachers they achieve a limited fulfillment, largely vocational or economic, or as pupils because forces more powerful than they decree their presence. Once within the boundaries of the classroom the "unnaturalness" of the classroom social situation asserts itself more. For here, in unbalanced distribution, are to be found firstly a number of children often neatly confined within a limited age range, and secondly one adult, probably female, who asserts power far beyond the limits that reason might (democratically) lead one to expect. Here as well is to be found a system characterized by some confusion, which tries nobly to be "all things to all pupils" but which often only succeeds in stressing examinable results that are subsequently, and often naively, equated with "education." In its personnel then, the manner in which they are constrained, the idealistic nature of its teaching objectives, and the procedures by which attempts are made to achieve those objectives, the classroom is manifestly different from other social groups.

To the extent that classrooms can be identified as behavior settings, there must be elements that give them identity as classrooms. This identity is not vested solely in the material phenomena involved (although classrooms usually have a distinctive shape and are complete with a number of recognized teaching ends), nor is it vested in its personnel (although manifestly a classroom usually has a teacher and pupils, and no one else). Rather, the identity of a classroom derives in large degree from the characteristic acitvities and prevailing behaviors that repeatedly occur within it.

In such a context, classroom activities consist of those joint, social events that appear within the ongoing flow of classroom occurrences. Typical activity distinctions that might be recognized by classroom teachers include "discussion" versus "lecture," group singing, seat work, or lesson summary. Such states are jointly social; they pertain not to the actions of individual pupils, nor do they depend on the style of the individual teacher. Rather, each one is a unique, collective set of performances that may easily be recognized and may be discriminated from other recognizable activities.

In formal terms, an activity may be defined as an organized, collective action. In this definition: *action* means that activities have a "doing" component (as opposed, let us say, to lazing), *organized* means that activities have an observable patterning of some sort, and *collective* means that activities involve more than one person. Classroom activities are those that take place in the classroom in the course of a school day.

As we are using it here, activities should be clearly distinquished from *classroom acts*. Acts are the individual and meaningful units of behavior. A question asked by a pupil, for instance, is normally a classroom act; the discussion during which the question is expressed is the enfolding classroom activity. Activities are, of necessity, made up of acts; but activities have properties that transcend those of the acts from which they are composed. For example, an act analysis would tell us that a given moment in time the pupil was holding up his hand, or looking intently at the teacher, or looking out the window apparently unengaged. An activity analysis tells us about the joint characteristics of the classroom social system -- about the number or proportion of pupils who are holding up their hands, looking intently at the teacher, or staring out the window. Act and activity analyses are complementary; but neither replaces the other.

Several observations should be made about the types of concepts we are using for classroom activity analysis here. (Most of these are made in response to challenges suggested by the review of prior classroom research presented in Chapter II.) For one thing, the concepts developed here are analytic rather than concrete. It is perfectly possible, for instance, to make a classification of classroom activities in terms that would be presumably familiar to teachers and pupils. (Such a classification has, indeed, been suggested by Gump.) It is reasonable to presume, for instance, that the primary classroom day is broken up into a series of activity events designated by such terms as "mathematics lesson," "singing period," "milk money time," and the like. We have chosen to handle the study of activities in another fashion -- by dissecting activities into their analytic components. Our decision is based on several premises: (1) that secondary classrooms do not exhibit a ready-made vocabulary for classroom activities; (2) that concrete classification systems really do not provide the analyst with much new information about what is going on, and consequently it would be necessary to study activities from an analytic standpoint anyway; and (3) that most common terms used for description of classroom activities are actually unclear. This last point is indeed the most important. In our empirical investigations we actually began by assuming that it was possible to recognize "lectures," "discussions," and other wholistic activity forms. We discovered to our chagrin that these words simply did not discriminate classroom activities from one another. Most "discussions" involved a good deal of lecturing on the part of teachers; most "lectures" involved discussion on the part of pupils; and we found it far more reliable to code the actual aspects of activity forms as they ebbed and flowed.

Another characteristic of the concepts developed is their objective posture. In Chapter II it was suggested that behavior forms (including activities) can be coded for intention, objective characteristics, and effects. For several reasons we have felt it wisest to confine our concepts to the objective sphere. For one, objective characteristics of activities are probably the easiest for the observer to judge. This was particularly important since we have reason to believe that ours was the first project to make an analytic investigation of classroom activities. However, we also had in mind some of the broader implications of the model for classroom analysis discussed in Chapter II, and particularly the need for developing activity concepts which could at a later date be related to other components of the classroom such as those of teacher and pupil acts, teacher intentions, and pupil effects. These relationships would be facilitated by confining our attention to objective characteristics of activities.

Still another characteristic of our concepts is that they were designed to be coded with anlytic rather than arbitrary or phenomenal units of time. As suggested in Chapter II, some classroom investigators have chosen to code behavior using arbitrary units of time (for instance, every three seconds), while others have utilized a phenomenal "episode" for which various, analytic codes were made. Since we had at our disposal the richness of videotape records, we made an initial decision to avoid this sort of arbitrarily decided procedure. However, the decision to abandon the phenomenal "episode" came harder. It would have been convenient, indeed, to have been able to recognize firm activity boundaries and to separate the classroom stream into activity episodes that were clearly distinct from one another. The only difficulty with this solution is that various characteristics of activities have the annoying tendency to change their states independently of other activity characteristics. Consider, for instance, the relationship between communication structure and subject matter. While considering the same subject, classroom activity may change from a lecture format to a discussion then to a free exchange among students and then back to a lecture. Alternately, while still retaining a lecture format, the subject under discussion may change from quadratic equations to diminishing classroom noise to rituals appropriate for addressing the teacher. Are changes in either communication structure alone or subject matter alone indications of activity boundaries? The only apparent solution to this problem would seem to be to allow whatever boundaries to occur as may be observed and to adopt analytic units for each activity characteristic that is differentiated; and this has been our solution to the problem.

It is also clear that concepts developed here for activity analysis reflect the methodology of videotape recording. It seems to us unlikely that a "live" behavioral observer would be able to make more than one or two of the many distinctions made for activities here if he were attempting to encode classroom activities directly. Even a number of live behavioral observers might have difficulty. Although all concepts reported here are judgeable with high reliability, in part that reliability is generated by the videotape record which may be replayed over and again as needed by the behavioral observer. Thus, the concepts were not developed for immediate, practical application by way of usage by partially trained observers or in teacher re-training. On the contrary, our aim in this research has been to seek as broad an understanding possible of the observable characteristics of classroom activities. We have sought a deliberately wide range of concepts in the hope that "some" of them will prove useful in discriminating classrooms from one another or in helping us to predict to the effects of classroom experience on teachers and their charges. It will, thus, be appropriate to review the status of each of the sets of concepts proposed here at the conclusion of our empirical presentation, although in this research we have but one criterion for judging the strength of activity concepts -- that of differentially characterizing classrooms that differ in terms of four, independent variable characteristics.

Activity Structure

Following common usage in sociology, it may be observed that classroom activities exhibit both structural and functional properties. Structure means an order that is observed to persist among the components of an activity -- among its communicating actors, their roles, their spatial locations, the patterned ways in which they address one another. Function, in contrast, refers to what goes on within the activity unit -- to those properties that are exchanged, communicated, or accomplished. To give an example, structure refers to the size and composition of a group; function refers to what the group is doing.

Various structural characteristics of classroom activities may be observed. We have found it convenient to separate conceptually four aspects of structure: the positions of classroom actors, communication structure, role allocation, and role location.

Each of these structural components is defined in such a way as to be conceptually independent of the other three. In addition, we have also studied three additional components that are defined in terms of reductions among the previously-defined components: role structure, role assignment, and positional location. We turn now to a detailed presentation of each of these structural characteristics.

Positions of Classroom Actors

Social positions are classification concepts which organize and differentiate sets of persons. For example, the classifications of "male" and "female" form a set of mutually exclusive social positions, as do "mothers" and "fathers," "policemen" and "criminals," and so on. Most systems of positional classification have but peripheral relevance to education. For example, father's occupation is often not known to pupils, and the strictures of lock-step education often result in nearly identical treatment being given to pupils who differ widely in interests, abilities, and backgrounds.

One positional classification has overwhelming significance for classroom analysis, however. Fundamentally, and for all classrooms, pupils may be distinguished from the teacher. It is usual to find representatives of other, related positions (such as principals, janitors, dieticians, school psychologists, or parents, etc.) in the classroom. Thus, the normal classroom activity is likely to be composed of pupils, or of pupils and the teacher, and no one else.

This does not mitigate the appearance of other, extraneous positional classifications from appearing in the classroom. It is possible to distinguish, for instance, Negro from white pupils, boys from girls, the handicapped from the normal, and the like. However, none of these positional classifications has universal relevance, and they have been ignored in the pilot study reported here.

Communication Structure

One of the fundamental, observable properties of classroom activities is that they do not always constitute a single, interacting group. In fact, the number of occasions when all members of the classroom are paying joint attention to a given stimulus may be in the minority. Often classrooms may be observed in which one or more individuals are gazing elsewhere or whispering to their neighbors, in which the micro-environment has ceased to hold the attention of others, or in which independent groups have been created for various purposes. The number and size of communicating groups is an observable property of classroom activities, and it is this property that we shall refer to as communication structure.

It is possible to define classroom groups in various fashions. Physical assemblages of persons may be observed, as when a set of pupils are huddled together in a back corner of the classroom. Groups may also be defined in terms of interaction, as for instance we would judge a group to exist only when its members were all directing active behavior towards one another. For purposes of analyzing classroom activities however, neither of these definitions is as useful as a simple one based on the concept of activity. A classroom group consists of those persons who are involved in a classroom activity; that is, whose actions are organized and collective. Such a definition allows a set of persons to be tied together by a wide variety of criteria. For instance, a set of pupils who are presumably paying attention jointly to the teacher, a frog, a TV scene, or any other common stimulus constitute a group by this definition. Usually, but not always, classroom groups are organized by the exchange of symbols among its members, however some groups may be organized through physical or sign exchange. In this minimal sense, all classroom groups are presumed to be communicative; and we say that the members of the group are collectively engaged with some common stimulus.

Obviously, the classroom might contain as many isolated groups as there are members of the classroom. However, most classrooms exhibit but a small number of communicative groups at any given moment.

Usually there is a central group, which we define simply as any group which initially engages the attention of a plurality of actors. In the wholistic case when all persons in the classroom are engaged in but a single activity the central group is the only group in the classroom.

Often, however, pupils may undertake individual and solitary activities in the classroom, or a smaller group that does not involve the plurality of those present may come into being. In these cases the central group involves only a portion of the classroom actors. We have also adopted a convention that a communicating group that began as a central group (that is, with more than a plurality of the actors involved) remains a central group even though enough persons disengaged themselves from it so that less than a plurality is left.

One or more peripheral groups may also appear in the classroom, each of which initially engages the attention of less than a plurality of classroom members. Obviously, in the wholistic case when all persons are involved in the central group, no peripheral groups appear. One or more peripheral groups may occur simultaneously within a central group, or the classroom may be made up of peripheral groups alone with no central group. In fact, in the limiting case, it is possible to observe up to n/2 peripheral groups in a classroom composed of n individuals.

Finally, it is also possible to observe one or more non-involved individuals in the classroom, each of whom is isolated from others. For example, the child who is working alone on his own workbook is normally non-involved in communicating groups. So is the child who is staring out the window, or the teacher who is grading papers at her desk. It is possible, of course, to have up to n non-involved individuals in the classroom.

Codes for communication structure. Given the analytic distinctions between central and peripheral groups and non-involved individuals, it is possible to characterize classroom activities at any point in time in terms of some combination of these elements. For example, a classroom might begin as a set of non-involved individuals; the teacher then might call all persons together into a central group; then three work groups might appear with several non-involved individuals, etc. In this fashion, it is possible to characterize the communication structure of the classroom through the class hour or day.

By definition, there cannot be more than one central group in a classroom. However, there can be as many as n/2 peripheral groups and as many as n non-involved individuals. In actual practice, however, the existence of many peripheral groups or non-involved individuals is rare in most classrooms. Accordingly, we planned a coding system that called for a central group, up to two peripheral groups, and a single non-involved category (which was also used for placing persons who were involved in groups 3 through n/2). Such a coding system appears to handle more than 95% of classroom activities -- the greatest exception to this generalization appearing in secondary classrooms at the beginning of the class hour when the small groups created by the pupils before formal class activities have begun, persist for a period after the teacher's initial attempt at getting work started. The resulting code categories are given in Figure 3-1.

Figure 3-1. Coding Categories for Communication Structure

Central Group Only	01
First Peripheral Group* Only	02
Second Peripheral Group Only	03
Non-Involved Individuals Only	04
Central plus First Peripheral Groups	05
Central plus Second Peripheral Groups	06
Central Group plus Non-Involved Individuals	07
First plus Second Peripheral Groups	08
First Peripheral Group plus Non-Involved Individuals	09
Second Peripheral Group plus Non-Involved Individuals	10
Central plus First and Second Peripheral Groups	11
Central plus First Peripheral and Non-Involved	12
Central plus Second Peripheral and Non-Involved	13
First and Second Peripherals plus Non-Involved	14
Central, First, Second plus Non-Involved	15

*By convention, the first peripheral group to appear is identified, and a second peripheral group is coded only if it appears while the first continues. However, a second peripheral group may continue on by itself after the first peripheral group has decayed.

In terms of actual coding methodology, communication structure was identified wholistically by assignment of individual class members to communication roles (see the next section of this chapter). The above codes for communication structure were, therefore, recoded for us from primitive data by machine re-tabulation (see Chapter IV). We presume, however, that such communication structure distinctions could be discriminated directly by the behavioral observer.

Role Structure

Various kinds of transitory roles can be observed within classroom activities. Pupils may appear as "clowns," "fools," or "teachers' pets." Teachers may "lead," "guide," serve as a "resource person," etc. When first we began to worry about the wide variety of concepts pertaining to classroom roles we were at a loss to know with which of the many, role distinctions to begin. Eventually we decided to deal with a role classification system that related directly to the distinctions previously made for communicating groups.

By definition, a communication group consists of a set of persons whose attention is mutually engaged. Perhaps the simplest form of communication group consists of one in which its actors are commonly engaged in the role of audience, that is of passive recipience. A group composed of the single, audiential role may be exemplified by a group of pupils watching a television presentation, or a group of students copying materials from a blackboard. Another type of single-role group can also appear when all persons are emitting, such as when all are chanting arithmetic tables or the Pledge of Allegiance to the Flag.

When we turn to communicating groups whose members form two roles, two different role patterns may be discriminated. One of the more common role structures found in the classroom is that of the group formed from an emitter and an audience. For example, during the classic "lecture," the teacher is an emitter and the set of passive pupils the audience. On other occasions, a pupil may be the emitter while other pupils or the pupils and the teacher may form an audience. In such usage, the emitter is identified as the individual who is responsible for symbolic dissemination.

Another type of two role group is formed from an emitter and a target. In the classic example, two pupils form a group when one of them whispers to the other; the whisperer is the emitter, the other the target. Similarly, the teacher may emit a private conversation with a single pupil, or a similar tete-a-tete may be initiated (emitted) by a pupil. These latter examples illustrate one of the difficulties with emitter-target groups. The fact is that the roles of "speaker" and "listener" may often switch around rapidly within such a group while the structure of the communication group itself remains intact. Our method of handling this problem is to recognize as the emitter the first speaker and as target the first designated listener. Thereafter, the emitter may listen or speak, and the target speak or listen, without destroying the continuity of the group. This convention also tells us how to distinguish the emitter-target group from the emitter-audience group. In the former case the emitter and target may often be found switching the "listening" and "speaking" roles, in the latter the audience is defined as a listener only.

Finally, it is also possible to recognize three role groups in which emitter, target, and audience are all present. For example, such a group occurs when the teacher is holding a discussion with an individual pupil while witnessed by others in the class.

The three-role analysis of communicative roles suggested above is, of course, an arbitrary convention. It is possible to imagine communication groups with four or more differentiated roles (for instance, emitter, target, audience, and "dunce"). But once again, it appears on analysis, that most classroom activities seldom exhibit more than three roles, and the differentiating of emitter, target, and audience roles appears to give sufficient flexibility for handling most observed activities.

Codes for role structure. Role structure means the unique combination of communicative roles represented in a communication group. For instance, a communication group involving an emitter and an audience has a unique role structure, as does a group having an emitter, target, and audience. Given three, codable roles within any communication group (emitter, target, audience) it is possible to have nine unique role structures. However, four of these are precluded by definition. Neither a target nor an emitter can appear alone, for instance, nor can a target and an audience. The fifth, potential structure, "no roles," must be retained for coding in those cases where no communicating group occurs. (For example, should the central group not exist, its roles will not be filled.) The five, remaining structure codes are to be found in Figure 3-2.

Figure 3-2. Coding Categories for Role Structure

Audience alone	1
Emitter plus Audience	2
Emitter plus Target plus Audience	3
Emitter plus Target	4
Emitter alone	5
No codable roles	0

It should be assumed that these role structure codes apply equally to central and peripheral groups, although they do not apply to non-involved individuals (who by definition are not communicating). Thus, role structure must be coded three times. By convention, shifts from activity to passivity are allowed between emitter and target persons. Any other change in roles forces the coding of a new role structure for classroom activities.

The reader may have noted that there is some redundency between the concepts of communication structure and role structure. The nature of this redundency is based on the fact that role structures must be coded "0" when the group of which a role structure judgment is being made does not exist. Thus, for instance, with a communication structure code of "01," indicating that the central group only exists, codes for role structure for both peripheral groups will be forced to "0." If we assume that the complete set of role structure codes consists of a three-digit field (one digit for the central group and one each of the two peripheral groups), then each of those codes maps uniquely into one of the communication structure codes, the exact mapping being given by the distribution of zeroes in the three-digit field. We will find that some of the other structural distinctions made were coded in such a way as to generate partial redundancies of this sort.

Role Allocation

The generic term, role allocation, refers to the assignment of persons to roles. In a bridge game, for instance, someone must be "dummy." If we know that Mary is "dummy," we know who has this role allocation.

In the present study only two criteria were available to us for differentiating role occupants from one another. The first of these has already been discussed -- position. Classroom participants may be distinguished from one another as either teachers or pupils. It is possible to establish at all times what role is being played by the teacher or the pupils. Again, we have already intimated in our discussion of the difference between a central and peripheral group that it is possible to discriminate the number of members of a given position who occupy a given role. When identifying a communication role, it is possible to discriminate, for instance, whether that role is played by one, two, or more pupils. (Presumably, if there were more than one teacher present, similar observations could also be made about teacher number.)

For reasons of parsimony, a code for pupil number should not discriminate between 1, 2, 3, ... N pupils; such minute distinctions would force a recoding of activity structure every time a single pupil drifted in or out of a given communication role. This consideration suggested to us the following set of distinctions for number: single pupil, pupil segment (more than one but less than a plurality), and pupil quorum (more than a plurality).

Codes for role allocation. It is possible, of course, for any of the defined communication roles (emitter, target, audience) to be occupied by one or more persons, by the teacher, by pupils, or by some combination. On the other hand, the categories suggested above for pupil size are defined by mutual exclusion. Including the empty case, this means that there are only six categories that are acceptable for role allocation codes. These six are given in Figure 3-3.

Figure 3-3. Coding Categories for Role Allocation

Teacher alone	1
Single pupil alone	2
Pupil segment alone	3
Pupil quorum alone	4
Single pupil plus teacher	5
Pupil segment plus teacher	6
Pupil quorum plus teacher	7
Role not codable or missing data	0

It should be recognized that role allocation codes as suggested above may be given for each of the three roles defined for each of three groups (central and two peripherals). In addition, role allocation may also be judged for non-involved individuals. Thus, it is possible that for any given classroom activity ten non-zero role allocation codes would be given. In actual practice, however, it is extremely unlikely that all of these roles would be filled. It is hard, for instance, to maintain a classroom in which two (let alone three) emitters are competing with one another. In addition, it will be shown (in Chapter V) that during most of the class hour but a single communication group exists, either the central group or a single, peripheral group. Consequently, it is meaningful that we consider merely the implications of the three role allocation codes that are given to a single communication group.

Let us consider the role allocation codes given to a single communication group to be a three-digit field. For example, the code "103" signifies a group in which the teacher is the emitter and is communicating to an audience consisting of a pupil segment. The code "124" signifies a group in which the teacher emitter is exchanging with a single pupil target, while being watched by a pupil quorum audience. Given eight, possible role allocation codes, there are altogether 512 possible three-digit numbers that would signify the role allocations for a communication group. Of this large number, however, the code "000" is vacuous since it is used only when no group exists. Many of the other numbers are prohibited by our coding roles. For instance: (1) If a code number for the teacher appears for any role, such a number may not appear for another role. (2) If a code number for a pupil quorum appears for any role, it may not appear for any other role. (3) Etc., etc. This still leaves a large number of meaningful codes. For instance, for the emitter audience situation only, the following codes may be allowed:

103, 104, 203, 204, 205, 206, 207, 303, 304, 305, 306, 307, 403, 405, 406, 503, 504, 603, 604, 703.

This does not mean that all numbers will appear or are equally likely to appear. (See Chapters V through VIII for an exposition of those numbers which actually appeared as types of classroom activities.)

The reader may have already noted that role allocation as coded is somewhat redundant of role structure, and by extension, of communication structure too. Thus, if we consider the total set of role allocation codes for any given activity (a ten digit field) each of these numbers maps into a total role allocation code (defined as a three digit field) and thus also into a communication structure code. Much of this redundancy, however, is avoided when we consider only the role allocations of but one group at a time. For example, if we look only at the role allocations of the central group, by definition communication structure must show a code in which the central group appears (01, 05, 06, 07, 11, 12, 13, or 15), but all possible conditions of role allocation codes may in fact be paired with each of these communication structures. In essence, role allocation as coded is a generic variable that generates not only role structure and communication structure but also role assignment as we shall see next. It is not, however, conceptually related to locational codes.

Role Assignments

Whereas role allocation refers to the assignment of persons to roles, role assignment as we are using it here is its inverse--the assignment of roles to persons. By definition, a "complete" role allocation inventory would give one the same information as a "complete" role assignment inventory. One would then know the roles occupied by each individual and the individuals associated with each role. However, two facts make the separate analysis of role assignment a needed task in the present study. First, our only method of identifying individuals is by their positional membership; pupils are not otherwise differentiated from one another. Second, given the manner in which role allocation codes were made, it is possible for a given classroom individual to appear in any of ten digital positions within the code--and the analysis task of following the individual around is relatively unrewarding. Such considerations argue for the adoption of a role assignment code for the teacher only.

Codes for teacher role assignment. In the code adopted for teacher role assignment, it is possible to recognize ten different roles that may be played by the teacher. These are given in Figure 3-4 and were coded by machine transposition from the role allocation information discussed in the previous section of the chapter. Obviously, again this information is again somewhat redundant of role allocation; in fact, total role allocation codes also map unambiguously into teacher role assignment codes.

Figure 3-4. Coding Categories for Teacher Role Assignment

Teacher non-involved or out of the room	0
Teacher emitter of the central group	1
Teacher target of the central group	2
Teacher audience of the central group	3
Teacher emitter of the first peripheral group	4
Teacher target of the first peripheral group	5
Teacher audience of the first peripheral group	6
Teacher emitter of the second peripheral group	7
Teacher target of the second peripheral group	8
Teacher audience of the second peripheral group	9

Role Locations

So far the codes presented provide information about the number of distinct communication systems and the roles defining each system. But where are the actors in the physical space of the classroom? Are performer and target close to one another, or are they separate? Is a classroom group tightly knit, or is it spread around the classroom?

Two possible strategies exist for answering these questions. First, it is possible to define location in terms of such props as blackboards, desks, and the like. Second, it is also possible to define location in terms of a classroom grid which tells us approximately how far actors are apart from one another. Our choice has been for the latter of these two alternatives. The reason for this decision was a practical one. In order to assemble common information from a variety of classrooms that differ strikingly in terms of physical dimensions, arrangements, and equipment, it was necessary to devise a coding system that transcended these distinctions.

Our first tentative solution to this was to define precise floor space area which would be applicable to all classrooms. One immediate problem was to orientate this system.

For example, some classrooms have as their "front" the long side of the rectangle and some the short side of the rectangle. For most classrooms the blackboards are at the "front" of the room, but some classrooms have blackboards at the side or rear. Again, the teacher's desk is usually at the "front," but some teachers appear to have placed it at the rear, away from the direction towards which the pupils' desks are facing. Most classrooms exhibit individual desks for pupils, but in others pupils may be organized around large work tables, and in one classroom we have studied the pupils' desks were actually arranged in two separate groups -- one pointing north, the other east!

Nonetheless, we find that irrespective of the disposition of furniture and personnel, in every classroom there was a location recognized as the "front" of the room. For example, pupils told to go to the "front" of the room were never at a loss to do so.

Consequently we built a terminology that first discriminated the "front" section of the classroom from its mid-section and its "rear," and, second, complemented this with a second terminology that discriminated one side of the classroom from the other. In building this terminology we adopted a primary definition for each locational distinction and then made conventions which allowed it to be adopted to peculiar classroom arrangements. The primary definitions for the front-back distinctions were as follows:

Front -- That area of the classroom between the forward pupil's desks and the forward wall of the classroom.

Forward -- That area of the classroom beginning with the forward desks and encompassing the first two rows of pupil's desks.

Middle -- That area of the classroom between "forward and back."

Rear -- That area of the classroom encompassing the last two rows of the pupils' desks including the last row.

Back -- That area of the classroom between the last row of pupils' desks and the back wall of the classroom.

Diffuse -- An area of the classroom inclusive of two or more front-back areas. (Usually coded for a communication group that was sufficiently large to extend over two or more vertical categories, it was also possible to code for actors whose location was "vibrating" in a vertical plane.)

In terms of these definitions "middle" was residual category whose size expanded and contracted in terms of the total number of rows of pupils' desks present in the classroom. In actual practice, the middle category usually was applied to a vertical space defined by between two and six rows of desks. It should also be understood that each of the above definitions defines an area that extends clear to the side walls of the classroom.

Primary definitions for the horizontal distinctions were similar.

Right Side -- That area of the classroom between the last column of pupils' desks on the right and the right side wall.

Right -- That area of the classroom beginning with the right column of pupils' desks and encompassing the first two columns of desks.

Center -- That area of the classroom between right and left.

Left -- That area of the classroom encompassing the last two columns of pupils' desks including the last column on the left.

Left Side -- That area of the classroom between the last column of pupils' desks on the left and the left side wall.

Diffuse -- An area of the classroom inclusive of two or more side-by-side areas.

Once again, in the above definitions it should be recognized that all horizontal distinctions extend clear to the front and rear walls of the classroom, and "center" was a residual category that varied from simply an aisle to include several columns of desks.

Codes for role locations. The definitions given above could be used to code the locations of role occupants, positional members, or individuals in the classroom. It might be possible, for instance, to code the appearance of physical collections of individuals, regardless of whether or not they constituted a communication group. However, we decided simply to code the locations of those actors who had previously been identified within the role allocation coding system. Thus, the code below was made for every individual emitter, target, and audience, for a communication group and also for non-individuals. Ten separate codes for role location were thus possible for any given activity state. The codes given were defined as a two-column field as given in Figure 3-5.

Figure 3-5. Coding Categories for Role Location

Vertical Dimension		Horizontal Dimmension	
Missing Data	0	Missing Data	0
Diffuse	1	Diffuse	1
Front	2	Right Side	2
Forward	3	Right	3
Middle	4	Center	4
Rear	5	Left	5
Back	6	Left Side	6
Not Clear	9	Not Clear	9

It should by now be clear that the intersecting set of distinctions given in this code divide the classroom into a grid of locations. This grid may easily be drawn, and an example of it appears in Appendix A which presents the coding rules used for training coding personnel. Examples of typical codes under the system may easily be given. "00" would be coded if the location of the actor was unclear (usually a target pupil). "11" is coded whenever an audiential group is located diffusely in the classroom. "24", front-and-center, is the location most often occupied by the teacher, and so on. In the case of really odd classroom arrangements, the investigators simply drew a map of the classroom and segmented the areas of the room in such a way as to preserve, to the best extent possible, the meanings of the verbal conventions with which the code is defined. This map was then furnished to the coder.

Positional Location

As suggested above, it is possible to use the same coding categories for the location of individuals or position members in the classroom. Indeed, once a complete assignment of locations has been made in terms of the role allocation code, it is possible to identify in a unique fashion the physical location of one position member at all times -- the teacher. As originally coded in the role location code, the teacher, of course, appears in various locational categories -- depending on her role allocation. It is possible, however, to extract this information from the role allocation code and to reproduce it elsewhere as a separate code for positional location. The resulting code for teacher location is also a two-column field defined in terms of the coding categories that appear in Figure 3-5.

Non-Coded Structural Characteristics

While still on the subject of structural concepts, it might be wise to review briefly some of those structural properties of classroom activities that were not dealt with in the system presented here. In general, these fall into two, viz. conceptual classes ignored completely, and additional concepts that might have been used within the conceptual classes accepted.

Perhaps the greatest shortcoming of the system at the moment is its avoidance of classroom ecology. The locational code is but a poor substitute for definitive information about the locations of blackboard, desk, door, and windows; and it is clear that distinctive activities collect around such fixed props like the pencil sharpener and the supply cupboard. Similarly, the code as such makes no allowance for the usage of movable props, for objects that are studied, written upon or with, created, maintained, or destroyed in the process of classroom interaction.

In defense of our decision to exclude ecological properties of classroom activity from this initial pilot study, it should be recognized that the sample of classrooms we were able to process was reasonably small and remarkably heterogeneous with regard to ecological properties. In addition, props tended to vary with other, coded activity characteristics (particularly with location), and we felt it would be difficult to untangle their unique effects with such a small sample. Finally, as far as the use of movable props is concerned, we feel that these should more fruitfully be coded as characteristics of individual acts rather than joint, social activities. Nevertheless, we recognize the ecological shortcoming of the system.

Another "missing" element of the system is the bundle of concepts we discussed in Chapter II under the heading of "characteristic roles." It is patent that pupil behavior in the classroom is not homogenous, and that individual pupils (and teachers for that matter) exhibit characteristic modes of behavior which form an activity context against which others play out their part. We found ourselves strongly handicapped in studying such phenomena, however, due to our sampling procedures. The recording of but a single class hour for a given classroom provides information that is insufficient for making much headway in differentiating pupil behavior. In a similar vein, we were unable to more than guess at the unique, cultural elements that might have grown up within the classrooms studied.

Finally, it should be re-emphasized that the present concepts for studying activities in the classroom are purely analytic. It would presumably be of some interest to construct a system of concepts for the concrete classification of classroom activities. Taking as our model the primary classroom day, such concepts might possibly break up the day or class hour into a set of events. It would then be possible to examine the structure of concretely designated activities in terms of the analytic codes described in our study. Without such a classification, our reported data must be based on the lesson, and on differences among lessons classified in terms of various independent variables. To rephrase, it would be reasonable to analyze the activities characteristic of "milk money time," "getting on wraps," "settling them down," in addition to "social studies lesson"; while in the present study we are able to analyzed only the activities of lessons taken as a whole.

Let us now turn to the problem of further differentiation within the sets of concepts already suggested for structural analysis of activities. Perhaps the clearest "shortcomings" of the system used lies in the field of pupil differentiation by positional membership. Pupils differ in such obvious physical characteristics as race, sex, and body build and so on. It would be easy to devise further coding distinctions that reflected these characteristics. In addition, pupils are also classifiable in terms of non-observable characteristics such as abilities, the occupations of their fathers, their statuses in terms of physical handicaps, and the like. With such classifications it would be possible to examine, for instance, the differential roles played by boys and girls, the locations within the classrooms occupied by minority group members, the degree to which handicapped pupils entered communication groups. In terms of the codes suggested, differentiation of pupils by positional membership would allow more complex role allocation and role assignment codes to be used.

The classification proposed for communication structure proved very effective for the current study. However, it is likely that in other classrooms, characteristics would occur where more than three groups were in existence. The coding system can easily accommodate such an exigency. As a result, communication system structure would turn out to be more complex and varied. If this is so, the full range of communication system structure has yet to be determined.

It is difficult to believe that the classifications proposed for role structure could be much improved on. More than three communicating roles occasionally appear in communication groups, but the roles of emitter, target, and audience appear to capture the majority of transitory differentiations that appear within classroom activities. (This observation, in turn, suggests the severe limitations under which classroom activities in fact operate. Games, parties, plays, parliamentary procedures, debates, jury trials, political rallies, and so on would probably require different kinds of roles. But such activities do not often occur in the classroom!)

It is also difficult to see how the system of locating role actors in the classroom could be improved upon. It would be possible, of course, to make much more minute locational distinctions within any given classroom; but classrooms differ so from one another that the assembly of locational findings from a variety of classrooms would be difficult if a unique system of locations were used for each.

In summary, the system as it is could probably be improved both by including more structural dimensions and by further differentiation of some of the existing categories. Of the former sort of omission, we would favor the addition of ecological, characteristic role, and concrete concepts for the classification of activities. Of the latter sort, we favor consideration of the positional membership of pupils. However, the concepts for communication structure, role structure, and role location are probably differentiated as fully as practicable for classroom analysis and should probably be retained in nearly their present form in future research.

Activity Function

Classroom activities have other properties than their structural ones. Things "happen" within activities, states are reached, behavior is organized and directional, identifiable "goals" appear to be reached or frustrated. In a sense, function gives us the "content" of activity, that which fits into the organized condition described by structure and which justifies the appearance and persistence of structure. Or to put it another way, because of the appearance of structure, functions can be performed; without structure, functional accomplishment is impossible, although the maintenance of certain forms of structure (for example, quiet and decorum) often becomes a function in and of itself in the classroom.

The ultimate functions of classroom education are manifold. Some of these are either specified by educational ideology, by law, or by common consensus. Schooling should accomplish such purposes as the inculcating of minimal communication skills in pupils, should avoid either physical or emotional damage, should occupy the time of pupils for minimal portions of the day, etc. Other ultimate functions are less agreed upon but may nevertheless be observed. Education serves economic, recreational, baby sitting, inspirational, creative, occasionally (and illegally) religious, and other ends -- many of which are represented by overt activity in the classroom.

It is difficult, however, to devise a coding system for classroom activities that reflects such ultimate functions. Many activities would appear to bear at least minimal functional relationships with any of a variety of ultimate goals for education, and it is difficult to differentiate obviously distinct activity types in terms of distal goals. On the other hand, it is possible to devise a set of proximal functions for classroom analysis that enables one to differentiate among classroom activities with consistency and reliability. Such functions are somewhat less "uplifting" but are in fact more useful for describing the activities characteristic of a given type of classroom. We have found it convenient in this study to separate two aspects of proximal function in the classroom: content, and mode. We turn now to the presentation of these two functional characteristics.

Functional Content

It is assumed here that classroom activities can concern themselves with but four types of content: relevant subject matter, non-relevant subject matter, sociation, and organization. Subject-matter content is concerned with "task" elements that are derived mainly but not exclusively from syllabus and curriculum prescriptions. Sociation content relates to interpersonal exchanges concerned with affective and social or emotional behaviors. Organization content is identified with those activities that are directed towards the maintaining and perpetuating of the classroom as a functioning system. We take up these distinctions in detail.

Relevant Subject Matter. Two kinds of educational subject matter are recognized in the model. Relevant subject matter refers to activities that have as their focus the "assigned" subject matter of the lesson. For example, in an "arithmetic lesson," relevant subject matter refers to activities that are concerned with mathematical symbols, their meanings, their logic, their implications, their use. Thus, the "relevance" of subject matter depends solely on a prior knowledge of the assigned subject matter of the lesson and an ability of the coder to distinguish materials that are pertinent to this subject from those which are not. For obvious reasons, during those times when a classroom was not dealing with a lesson -- for instance, in the primary classroom when pupils were putting on their wraps to go outdoors -- it would be impossible to recognize the content of relevant subject matter.

Non-Relevant Subject Matter. Many communications in classrooms, though concerned with areas of legitimate educational interest, do not always bear on the subject ostensibly being taught. Thus, even an arithmetic lesson can be punctuated by excursions into social studies, biology, literature, one's trip to Mexico last summer, or the location of public buildings in the community. Such "digressions" are collectively classified under the heading of non-relevant subject matter here. The fact that subject matter may be non-relevant carries no implications of value. Many ultimate goals of education are served by the introduction of non-relevant materials, and it may be that the effective teacher will be found to weave mathematical examples into social studies and seek to apply even spelling expertise to an understanding of civic problems. In essence, the distinction between relevant and non-relevant subject matter is simply that of recognizing the arbitrary assignments of educational curricula.

Sociation. In the conventions suggested here, sociation is a classification applying to activities which have as their focus the feelings of persons of individual relationships among class members. In other words, sociation denotes the processes of being sociable (either negatively or positively), of performing social conventions, or of communicating about sociability. Let us consider some examples. Conventional phrases such as, "good morning class," "how do you do," or "did you have a good vacation?" are phrases that are sociable conventions. Exhortations to "be good citizens," to "stop fighting," or to "consider the importance of good manners" concern themselves with sociability per se. When the teacher comforts the distressed child or dresses a wound, he is also taking care of sociability needs. The pupil (or teacher) who reports pain or sleepiness is dealing in sociability. As opposed to subject matter content, in which the focus of attention is on materials that are "outside" of the system, sociation focuses on materials that are "inside" the classroom personnel.

Organization. Whenever the content of an activity is devoted to matters that directly involve the administration of the classroom, we judge the activity to be concerned with organization. Under this heading fall activities that are concerned with controlling and directing all or any of the personnel or artifacts in the setting. It thus covers the numerous teacher directives that facilitate (sic) the functioning of the classroom. It also covers any communications concerned with similar matters which emanate from the students. The effectiveness of such communications is not, of course, under review when organization is coded. In comparison with subject matter and sociation, the locus of organization is the classroom as a social system and those problems engendered because some thirty-five people must inhabit a common space and deal with common problems.

Content Interpretation. Some insight may be gained into the meanings of our content categories by comparing them with those originally advanced by Bales (1950). Bales' coding system differentiated two, general areas of content -- those communications dealing with the "instrumental-adaptive (or) task area" and those focusing on the "expressive-integrative social-emotional area." In our terms, the first of Bales' categories is subject matter, the second sociation.

Now let us speculate on the differences between our system of content coding and that of Bales. Why did not Bales differentiate between "relevant" and "non-relevant" task communications? In presuming an answer to this question it should be pointed out that Bales' categories were devised to encode communications among adults who had been assembled for the first time into arbitrary, problem-solving groups. In such conditions, it is reasonable to presume that most of their communications that were focused on "outside" matters were, in fact, relevant to the task. Thus, it probably did not occur to Bales and his associates to encode non-relevancies, since they occurred with little frequency.

Why, then, were no coding categories provided for organizational communication? Again, consider that Bales' groups were composed of adults (who presumably share a large number of norms pertaining to organization) and were in fact maintained by the investigators in an experimental environment. In short, the groups studied would be expected to have a minimum of organizational problems. These observations are obviously not true for the classroom which has a large number of immature persons involved in it and which must maintain itself in the wider physical and social environment of the school. (We note in passing, however, that one of Bales' sub-categories, "problems of integration," comes close to the concept of organization, even though subsumed under the general category of "social-emotional area.")

It may be pointed out, however, that the four content categories suggested here (relevant subject matter, non-relevant subject matter, sociation, organization) form no more an exclusive and exhaustive set than do the Bales categories. By what magic do we assert the universal applicability of these four categories to the encoding of classroom activity concept? Two partial answers to this question may be suggested. First, it is difficult to conceive of any foci for activities other than those of the persons involved, the social system imbedding them, and matters "outside." Such distinctions, of course, make "outside" matters a basket category that includes all subject of discussion, from sex to sausages. Second, the same observation may also be made of non-relevant subject matter. Whereas relevant subject matter is defined by arbitrary inclusion, non-relevant subject matter must of necessity concern itself with all other non-classifiable subjects of discussion whether of educational content or not. For example, two adolescent boys holding a secret and smutty conversation are involved in an activity which has as its content non-relevant subject matter. Somehow, such usage seems a misnomer, which suggests that our unwillingness to break non-relevance down further reflects the fact that most classroom activities do, in fact, have subject matter as their content (apart from those concerned with sociation or organization).

The fact remains, however, that the category system offered is a gross one. Relevant and non-relevant subject matter, sociation, and organization may all be broken down into differentiated content categories. Bales suggests the partitioning of subject matter ("task") into problems of orientation, evaluation, and control, and sociation ("social-emotional") into problems of decision, tension-management, and integration. Another, distantly related breakdown is that provided in our mode system to be described in the next section. Other breakdowns of content are suggested in the work of Bellack et al (1963, 1965), B. O. Smith and others (1964), and Nuthall and Lawrence (1965). It remains to be seen whether these are useful for analyzing classroom activities. However, it should be pointed out that each of these other content codes (including that of Bales) was designed for expressing the content of acts, not activities. For the present we simply observe that it would be possible to obtain a more differentiated content code. Whether it is useful, or indeed possible, to do so at the level of activities is a matter for future investigation.

Functional Mode

It is also assumed here that classroom activities are characterized by one of three types of functional mode: operation, information dissemination, or intellectualization. Operation characterizes those activities in which no symbolic transmission takes place. Information dissemination occurs in activities during which symbols are passed from a source to at least one other person in a public manner. Intellectualization occurs in activities characterized by the examining of or relating of symbols again in a public manner. Let us consider each of these modes in detail.

Operation. It will be recalled that a classroom activity is defined as an organized, collective action that takes place in a classroom context. Some activities (such as lectures) involve the transmission or exchange of conventional symbols -- we deal with these in the next section. Others do not involve public, symbolic exchange. For example, activities such as practicing, drilling, physical exercise, and ritual* appear in typical classrooms. So do group singing, chanting, painting, and individual seatwork. In each of these examples, despite the fact that the activity may be public in that members are aware that other members are doing the same things, little or no transmission of public symbols takes place. We call such activities operations.

By definition, an operation does not involve the transmission of the conventional, symbolic meanings. Since operations are activities, however, they are organized. Upon what grounds may an operation be organized? In some cases it is reasonable to presume that participants in an operation share meanings of the situation which pattern their actions. For example, in such rituals as the pledge of allegiance to the flag, pupils usually have the formula memorized and can go through the motions without even minimal leadership by the teacher. In other cases, operations may be organized because of physical or sign (as opposed to symbolic) interaction. For example, the actions of two pupils who are pulling at two ends of a rope are clearly mutually interdependent even though they may not be exchanging symbols with one another. Again, some operations -- such as seat work -- appear to depend on the private transmission of symbols from a non-human source to the individual pupil, and should we observe that two pupils are both working industriously it is presumably because they are separately, although parallelly, engaged in the same task.

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*Including ritualistic and conventional exchanges such as "How do you do?" "Goodbye," and the like.

It is tempting to conclude that all actions of the classroom group must be at least operations; that is, that all group states must per se constitute activities. Tempting or not, this conclusion is specifically denied by our definitions. Unless group actions meet the minimal criteria of activity definition -- that they be collective and organized -- we cannot judge the presence of an operation. For example, noisy disorganization is not an operation, nor is the patently organized action of a single classroom member.

Information Dissemination. Activities characterized by information dissemination are those in which conventional symbolic meanings are transmitted among the participants. Statements concerned with providing facts, clarifying facts, comments, questions or assertions, illustrations or demonstrations are classified as information dissemination activities in that they perform the express function of exhibiting (or purporting to exhibit) information. We include in the information dissemination category activities whenever information is being disseminated, whether that information is correct or not, and whether the recipient of that information may be presumed to know it already or not.

The commoner forms of information dissemination involve two- or three-role communicating groups in which an emitter transmits information to an audience or an emitter and target exchange symbols. We can, however, judge the appearance of information dissemination whenever a public message is transmitted. For example, a group of pupils watching a television set or listening to a tape recording are involved in information dissemination. Similarly, a group that was engaged in the collective encoding of symbols for some other set of persons (for instance, a class that was recording their singing) would have been coded as involved in information dissemination.

Since the acquisition of information is presumed vital to educational attainment, it is not surprising to discover that many educational activities are indeed characterized by the dissemination of information. Facts are presented, interpreted, explained, elaborated, illustrated, and repeated with monotonous inevitability in the classroom.

Nonetheless, other classroom activities may be recognized in which no symbolic exchange is taking place (operations) or in which symbols are not being disseminated but are rather related (intellectualizations). In fact, the appearance of these other activity modes leads us to suspect that "good" teaching involves far more than simply the pumping in of information and that even a sophisticated teaching machine cannot substitute for the teacher and shared classroom experience. Operation has been dealt with, a discussion of intellectualization follows.

Intellectualization. Intellectualization refers to all activities that are devoted expressly to the procedures involved in considering or inducing symbols, reasoning about them, or deducing from them. It also includes such non-logical reactions to symbols as the expression of attitudes, opinions, and judgements. It also includes processes wherein symbols are interpreted, assessed, and evaluated. Whereas the emphasis in information dissemination is upon symbol transmission, in intellectualization the focus is upon the meaning relationships between symbols. As such, intellectualization is distinct from the "intellectualizing" that is (sometimes optimistically) inferred as lying behind communications made by individuals.

One of the conceits that many teachers permit themselves is that they teach their students "to think." Furthermore, whether it is due to the agency of teachers or not, it is abundantly clear that some pupils do in fact learn how to think -- at least in some fashion. It is presumed here that a proportion of the activities of the classroom represent actual procedures by means of which pupils may become familiar with the processes of thinking, reasoning, forming opinions, and the like. It is these activities to which we give the title, intellectualizations.

It is our contention that operations, information disseminations, and intellectualizations form a mutually exclusive set for the encoding of activities; that all activities that are clearly understood and that they may be encoded unambiguously in one of these three categories. Let us examine this contention. By definition, operations and information disseminations form a mutually exclusive set, the former constituting those activities which do not involve symbolic transmission, the latter those which do. By definition also, intellectualization is a type of information dissemination, since symbols are manifestly transmitted. By convention, however, whenever transmissions concern themselves with relationships among our reactions to symbols we code intellectualization -- while information dissemination, as a code, is reserved for activities in which symbols are simply "put out" and not related to one another. In summary, all activities are either without symbol transmission (operations) or exhibit public symbols; if the latter, they either involve the assertion of symbols (information dissemination) or the relating of symbols (intellectualization).

Mode interpretation. Both Bellack and B. O. Smith have suggested categories for mode, and a mapping of their mode distinctions into the somewhat more gross categories suggested for activity analysis here may be made. For example, Smith's concepts of "describing" and "reporting" are clearly categories of information dissemination. Other categories, such as "valuating, "opining," and "conditional inferring," are clearly intellectualizations. Still others, such as "defining," describing," "designating," "stating," "substituting," "classifying," "comparing," and "explaining" may be fitted into either information dissemination or intellectualization depending on context. The reason for the indeterminancy of these latter mappings appears to be that whereas Smith's individual items are defined independently, they do not collectively constitute a single set of mutually-exclusive categories. This may be seen particularly in the case of Smith's category, "directing and managing" which appears to refer specifically to organization -- a category from the domain of content rather than from mode.[1] It has already been pointed out that our three mode categories -- operation, information dissemination, and intellectualization -- form an exclusive set. It is also interesting to note that coding reliability for Smith's mode categories varies from unity to zero, which possibly reflects difficulty his coders had in discriminating categories from one to another.

In a larger sense, however, the challenge posed by Smith's finer mode categories is that of the possibly breaking down our mode system. It is possible, for instance, to recognize varieties of intellectualization ranging from formal logic to the revealing of emotional reactions to facts. Information dissemination may be subdivided into describing, reporting, defining and the like; while operation may be broken into ritual, practice, experience and so forth. At this stage it is not clear in what sense these subdivisions represent a logical and exclusive set, but the possibility of mode subdivision will be explored in future studies.

Codes for Functions

Given the existence of two, independently defined functional concept systems, content and mode, it is possible to recognize as many functional categories as may be provided by the intersection of the category sets for these facets. Four content categories were defined, and three mode categories were discussed. This means that twelve functional codes are defined by the intersection of the two systems. These twelve codes and their coding numbers are given in Figure 3-6.

Figure 3-6. Coding Categories for Functions

Group does not exist*	00
Operation with Relevant Subject Matter	11
Operation with Non-Relevant Subject Matter	12
Operation with Sociation	13
Operation with Organization	14
Information Dissemination about Relevant Subject Matter	21
Information Dissemination about Non-Relevant Subject Matter	22
Information Dissemination about Sociation	23
Information Dissemination about Organization	24
Intellectualization about Relevant Subject Matter	31
Intellectualization about Non-Relevant Subject Matter	32
Intellectualization about Sociation	33
Intellectualization about Organization	34
Function not clear*	99

*By convention, when either mode or content were unclear, "99" was coded. "00" was coded when the group whose function was to be coded did not exist.

It should be pointed out that functional codes, as suggested in Figure 3-6, may be given to all communication groups and are thus codable for the central group and for both peripheral groups should they exist. By definition, however, function is not codable for non-involved persons, thus only three functional codes takes care of the system we have evolved.

In contrast, with the structural codes where we chose to deal with each conceptual system separately, in analyzing the functions of classroom activities we chose instead to consider the two functional concept systems jointly as a single, two-digit code. This procedure reflected our assumption that there would be a strong interaction between these two facets, that intellectualization about subject matter would be quite different from intellectualization about organization. How right this assumption was may be judged from the findings chapters to follow.

Non-Coded Functional Characteristics

We have already discussed the possibility of additional content and mode codes. But what about other functional distinctions not included within the present code? Do the concepts of content and mode exhaust the set of viable facets with which classroom activities may be functionally distinguished from one another?

With respect to additional functional distinctions for classroom activities we are on a far less firm footing than when speaking of additional structural distinctions. The reasons are two-fold: our lack of vocabulary for describing the end-states of group activities, and our educational ideology which stresses the precedence of end-states for individual pupils. It is clear that noise, physical destruction of the classroom environment, class plays, exhibits, and many other products result from classroom activities. But from the viewpoint of educational traditionalists such products are "frills," and we have not bothered to develop a functional vocabulary with which to relate activities to their accomplishment.

It is also clear that with sophisticated teachers and older pupils, many classroom activities have functions that are delayed. Some activities may only be understood in the context of an activity sequence, or by studying longitudinal records of the classroom taken over a semester. Thus, while we set forth as a reasonable requirement the examining of additional functional concepts for classroom activities, their precise value poses distinct problems.

Units of Analysis

In this final section of the Chapter we take up a problem of units of analysis. It will be recalled in Chapter II that we differentiated between analysis systems by their treatment of coding units. Reviewed were systems that used: arbitrary units of time, naturally-occurring units, analytic units, and phenomenal units. Arbitrary units were those in which a code was made at some fixed interval. Naturally-occurring units were those which depended on the appearance of some keying event. Analytic units were those that were suggested by the nature of the concepts used by the investigator. Phenomenal units were those that appeared to be "natural" breaks in the stream of classroom processes. Which of these types of coding unit is appropriate to the system of concepts proposed here?

The concepts suggested in this Chapter for the analysis of classroom activities provide a number of different bases for judging activity boundaries. We have suggested, for instance, that communicating groups structure may be observed independently of the spatial group of persons, and that function is again orthogonal to these structural distinctions. Let us now recognize that any of these independently conceptualized aspects of activity may vary independently of the others. Or to put it in other words, structure may vary independently of location, or role allocation, or function. This suggests that analytic units are the most appropriate for our purposes.

Consider now the problem of episode boundaries. Is it necessarily true that when communication structure changes there will also be a change in the spatial locations of persons or alterations in content or mode? This is certainly not implied by the concepts themselves. Although it *may* be true that functional and structural boundaries tend to coincide, whether they do or not is a matter for empirical discovery and not for a priori judgment. Thus we cannot assume, as is done in structuring episodes in the individual life-history record (see Barker and Wright, 1955) that episodes have a "unitary" character. Instead, we will want to note *any* change of a facet of the activity environment as a boundary and then to investigate the coincidence of episode boundaries among other coded phenomena.

This suggests a definition. Let us define the *episode* to be a unit of time during which none of the codes given to classroom activity change. should one or more codes change--should role allocation be altered, or function, or teacher role assignment, etc. -- a new episode is entered. As defined, episodes are relatively molecular. They do have duration, however, and may be analyzed for durational or frequency aspects. A set of episodes constitutes a running record of the class hour. In operational terms, an episode may be thought of as a single IBM card into which are punched the various codes representative of the quasi-stationary activity state which persists for the duration of time indicated on that card. A deck of episodic cards, in sequence, would then represent the class hour.

For various reasons, the concept of episode so defined is not completely useful for analysis purposes. Let us concern ourselves with relationships between any two code categories. For example, let us examine the relationship between a functional state and a communication system structure condition (for example, the unit of time during which a teacher is disseminating information about relevant subject matter to an audience composed of all pupils in the classroom). We note that the joint functional-structural condition so defined may possibly persist through a variety of other coded changes. For example, again, the teacher may possibly wander around the room thus changing the coding of role location any number of times. However, if we are really interested in examining only the relationship between function and communication structure, we should like to ignore episode boundaries stemming from other, coded facets. We do this by defining a somewhat larger unit, the incident. In formal terms, an incident is a unit of time during which none of the codes from selected facets given to classroom activity change. Obviously the set of incidents within a given class hour will vary depending on the facets of activity we are analyzing at the moment. Obviously, too, incidents will be composed of one or more episodes, and the total number of incidents will be less than or equal to the total number of episodes of a class hour. Finally, if we are to consider all, coded facets for activity analysis, the definition of incident reduces to that of episode.

In Chapter VIII we shall make a related, but somewhat different, usage of these terms. Chapter VIII concerns itself with the sequential analysis of episodic data, with the problem of sequential effects among pairs of activity episodes that immediately precede and follow one another. In essence we are asking: given an activity state that is defined by codes in one or more facets, what activity states are likely to follow it? It is of course possible to make this type of analysis on an episodic basis. This is operationally equivalent to examining each sequential pair of IBM cards to see what type of information is generated by knowing the first card of the sequence. But again, it is possible for an activity state defined by one or more facets to persist through a sequence of several cards, during which other facets, in which we are simply not interested for the moment, change. Should we choose to display information for sequential pairs in the form of a matrix in which the first card of each pair is tabulated on the vertical axis and the second card of each pair on the horizontal axis, it turns out that pairs of cards for which a condition persists for the chosen facet(s) will generate frequencies along the major diagonal of the matrix. If we eliminate this major diagonal, this has the effect of removing the (spurious) generation of false sequential pairs and reduces the analysis to one which has an incident basis. By this usage, a sequential analysis of activity incidents generates an item for analysis only when there is a change in one of the facets which we are analyzing at the moment.

Because of the presumed unfamiliarity of readers with the episode-incident distinction, we shall review it at the beginning of each of the chapters in which results are reported.

Summary

The purpose of this chapter has been to present a detailed review of the concepts that were developed and operationalized in the research project reported here. These concepts were designed to operationalize aspects of classroom activities. We differentiated between concepts pertaining to activity structure and activity function. Finally we discussed the units with which record of classroom activities were to be analyzed.

The concept of activity was defined to be an organized, collective action, while classroom activities were those that take place in a classroom, during a class day, and involve the persons who are normally found in classroom events. Activities, so defined, differentiated from classroom acts, and although it was pointed out that activities were composed of acts, activities had their own properties that appeared because of the joint appearance and interaction of acts.

It was pointed out that activities could be analyzed for their structure, that is, for the order that was observed to persist among their components. Various aspects of structure were defined including the positions of classroom actors, communication structure, role allocation, role location, role structure, role assignment, and positional location. Specific codes were developed for communication structure, role structure, role allocation, teacher role assignment, role location, and teacher location.

We also differentiated codes for activity function, those thing which go on within an activity unit. It was suggested that the content of classroom activities could be analytically separated from activit mode, and a coding system was set forth in which both content and mod distinctions were made.

Finally, we discussed the strategy of analysis in terms of the units of analysis chosen, pointing out that the system was designed to use analytic units. Two analytic units were set forth. An episode is a unit of time during which none of the codes given to classroom activity change. An incident is a unit of time during which none of the codes *from selected facets* given to classroom activity change. It was also pointed out that incidents would always be composed of one or more episodes, and that an incident analysis would have an effect of reducing spurious unit boundaries in the reporting of findings.

CHAPTER IV

METHODS OF THE INVESTIGATION

This chapter is concerned with (1) the techniques of data collection used, (2) data processing, and (3) the sample of classrooms upon which the study was based. Since the project depended on the analysis of videotape recordings of intact classrooms -- and since techniques for making classroom videotapes are not widely employed nor standardized -- we shall describe our methods in some details.

Techniques of Data Collection

The making of videotape recordings required the assembly of a unique equipment facility. This facility is described first. Following is a description of the standardized techniques we found it necessary to develop in dealing with the classroom situation so that disturbance in the classroom and distortion of the classroom record would be kept to an absolute minimum. Finally, we discuss suggested modifications of the equipment and techniques.

Recording Equipment

The system used for making videotape recordings consists of two remotely-controlled video cameras, microphones of similar kinds, and control console, cables, a panel truck from which the system was operated, a portable tape recorder, the play-back facilities. Each of these components is discussed in appropriate sections below. The system described was designed by the two authors and T. E. Johns and built to specifications by Video Systems,

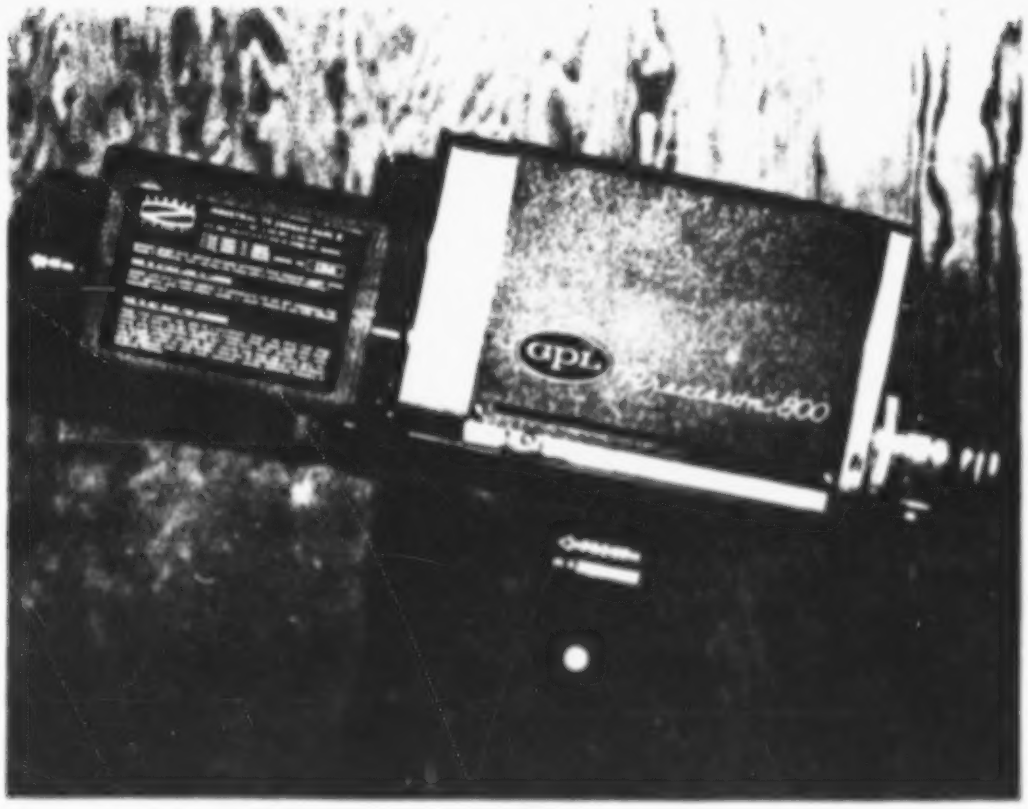

Figure 4-1 Camera, Zoom Lens, and Pan-and-Tilt Mechanism

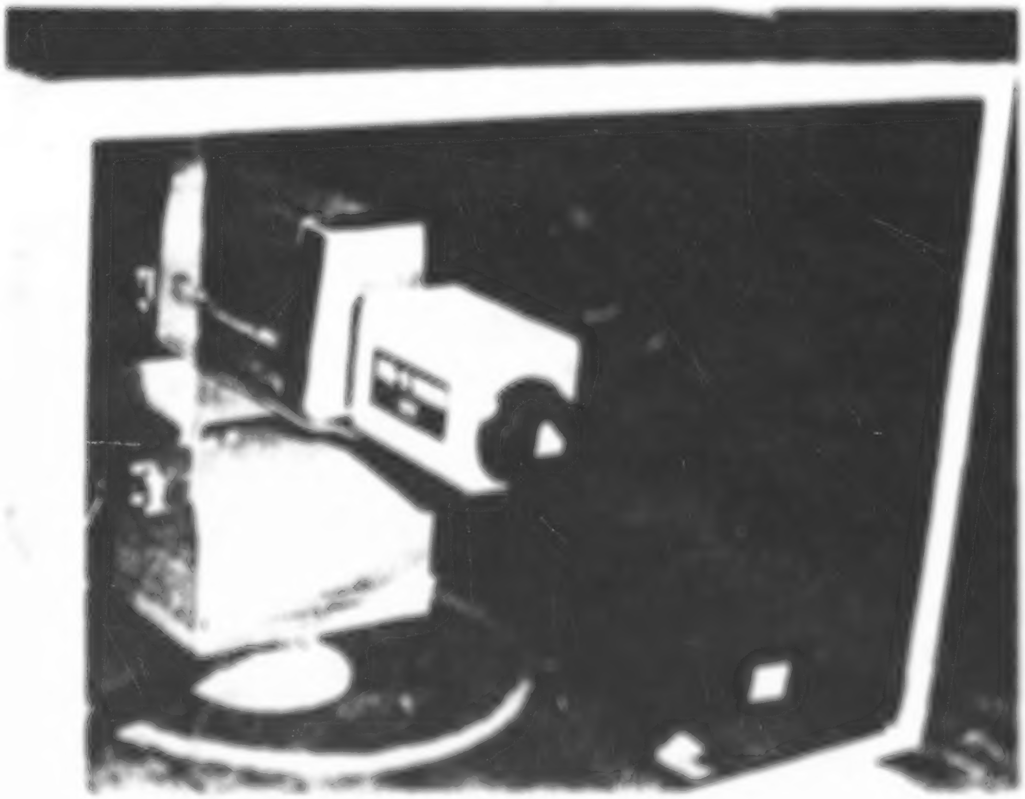

Figure 4-2 Camera Assembly Mounted in Glass-Fronted Box (with Lid Removed)

Inc. of Chicago, Illinois.

The Cameras. Two vidicon cameras with remotely-controlled zoom lenses and pan-and-tilt heads comprise the basic video unit. When used for making classroom records, each camera is mounted in a dark glass-fronted box, which has a black interior. The box both muffles the sound of camera movement and hides the camera from all but direct close-up view. Figure 4-1 pictures the camera and its zoom lens mounted on the motor-driven pan-and-tilt mechanism. Figure 4-2 pictures the camera mounted in its glass-fronted box.

In requesting bids for the cameras, we specified that cameras use vidicon tubes and that they meet EIA broadcast standards. All camera controls (including operation of the zoom lense and pan-and-tilt motors) come through a single cable which connects the individual camera with the control console. Included within the control cable is an audio communication system so that a person wearing a Western Electric type 52 headset at the camera may communicate with another at the control console.

Although several available cameras would have met the specifications written for the system, we use a Precision 800 camera together with a Pelco 550 pan-and-tilt head and a Zoomar Mark X zoom lens. For tripod operation, we use a Quick-Set Hercules tripod with a 550M adapter. The Zoomar Mark X zooms from 15 to 150 mm and provides from 4°48' to 45°32' of view-angle. With this lens zoomed wide, and the camera mounted in a corner of the classroom, we can record about 90% of the desks (or pupils' faces) in the average classroom. At the opposite end of the scale, with the lens zoomed in, we can focus on a single face or even upon the moving lips of an actor.

Microphones. Included within the system are 2 R.C.A. BK6B microphones, 2 Electro-Voice 647-A microphones, 1 Electro-Voice 642 microphone, and 1 Vega-Mike wireless microphone. The first four microphones listed are small, general-purpose microphones designed to pick up voices in an omni-directional fashion. The Electro-Voice 642 is a highly directional microphone designed for aiming at a sound source in a noisy environment. The Vega-Mike is a miniature broadcasting system which consists of a broadcasting microphone which may be hung around the neck of a subject and a receiver which is placed within 100 feet of the broadcasting microphone.

In making classroom recordings, we have found it most useful to suspend the four BK6B and 647-A microphones from light fixtures at strategic locations above the desks of pupils. When placed as low as possible, the gain for each microphone is adjusted so that ambient noise is least objectionable. We also place the Vega-Mike around the neck of the teacher who is thereby free to move around the room without trailing a cord. The four suspended microphones are used to pick up comments from isolated pupils or the group; the teacher's microphone is used to pick up teacher emissions or quiet interactions between the teacher and an individual pupil.

The Control Console. Operation of both the audio and video portions of the system are controlled at the keyboard of the control console which may be operated either in the truck or at a separate location. Figure 4-3 presents a general view of the face of the control console (mounted in the truck). Figure 4-4 shows the console in operation with typical classroom scenes on the video monitors.

Included within the control console are a variety of video and audio equipments. The video equipment includes a synchronizing generator, an effects generator, program monitors, control equipment, a program video switching system, a monitor switcher, and a control oscilloscope. Audio equipment includes two audio channels, monitoring amplifiers, speakers, and associated controls. Figure 4-5. presents a general block schematic diagram of operations.

The synchronizing generator performs the function of controlling and timing all video equipment in the system including cameras, the effects generator and the like. The generator used conforms to EIA and FCC specifications for broadcast use and is designed for maximum stability under conditions of varying line voltage and temperature. Generator timing reference is selectable to either the nominal power line frequency, an internal crystal oscillator, or an external reference source.

The effects generator is included so that signals from the two cameras may combined into one composite image for recording. (In normal classroom operation, one camera is focused on the class-as-a-whole while the other follows the teacher around the room. The teacher's face is then "inserted" into some "unused" corner of the classroom-as-a-whole image so as to make up a composite image which contains the faces of all actors in the classroom--see Figure 4-4.) The effects generator used is capable of placing

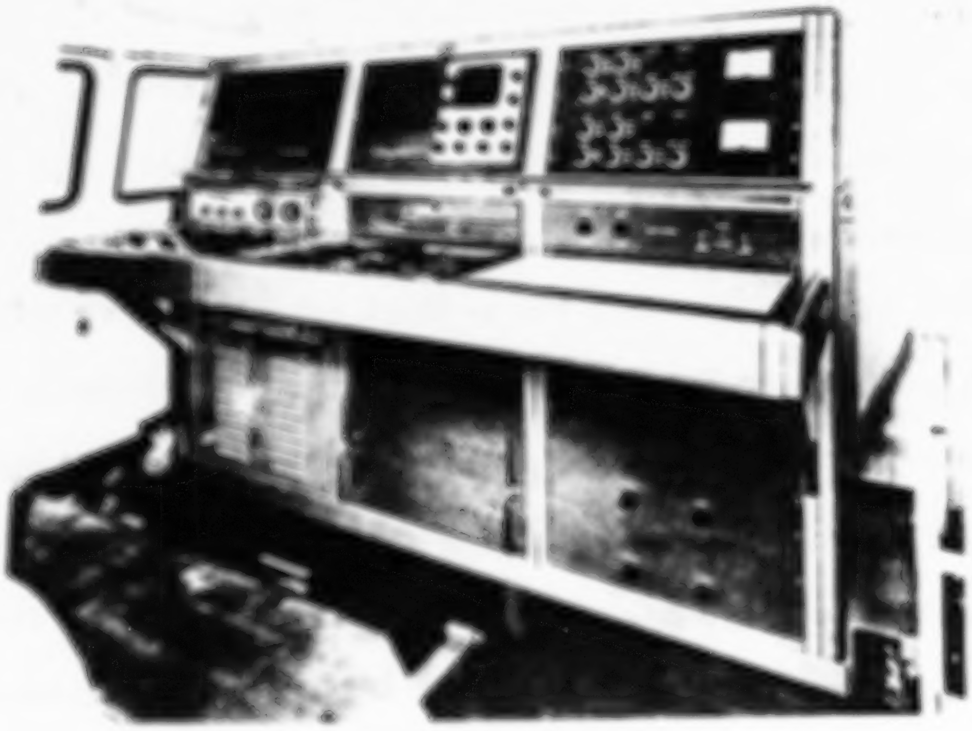

Figure 4-3 Controle Console Mounted in Truck

Figure 4-4 Control Console in Operation

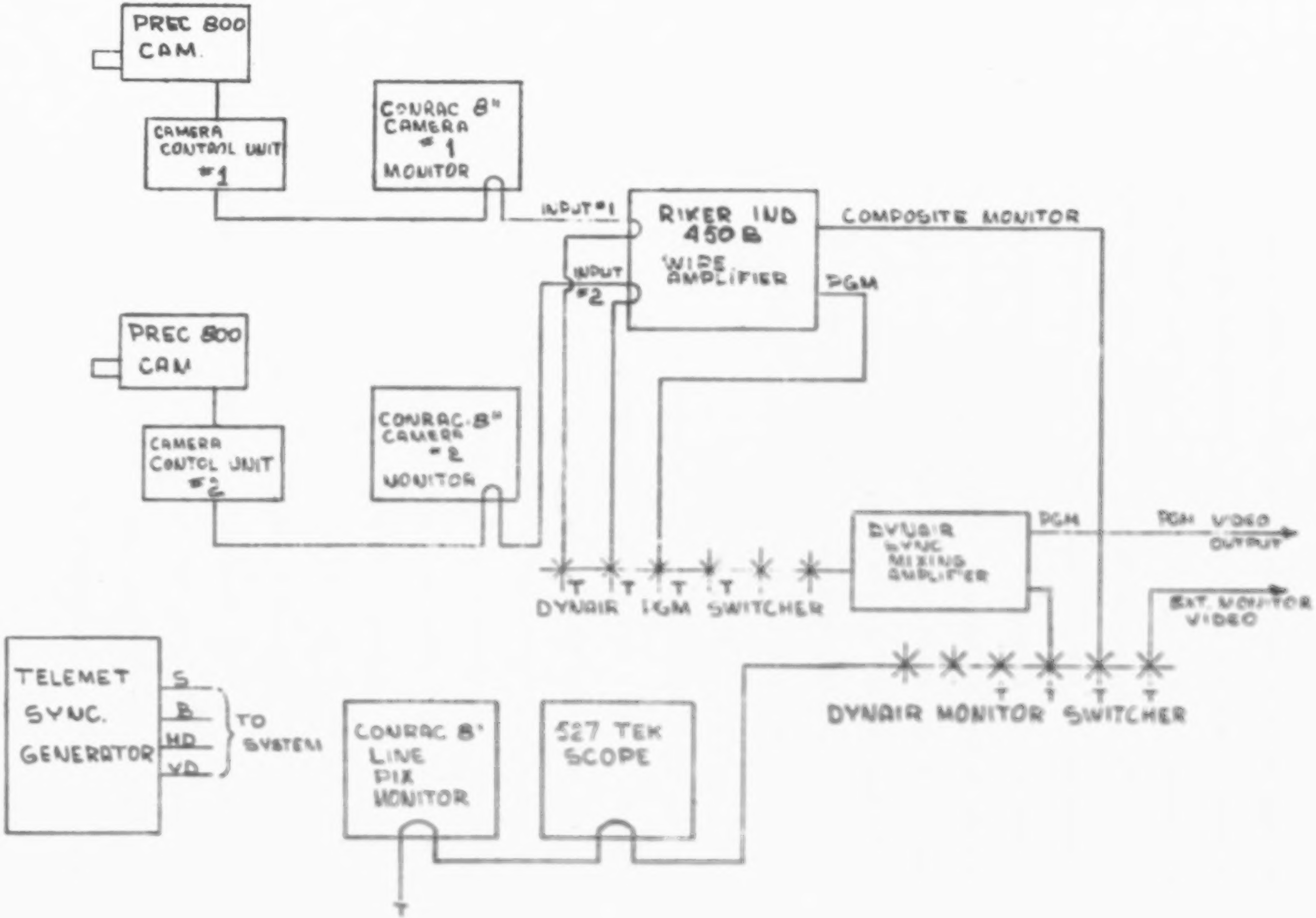
PREC 800 CAM.
CAMERA CONTROL UNIT #1
CONRAC 8" CAMERA #1 MONITOR
INPUT #1
RIKER IND 450 B WIDE AMPLIFIER
COMPOSITE MONITOR
INPUT #2
PGM
PREC 800 CAM
CAMERA CONTOL UNIT #2
CONRAC 8" CAMERA #2 MONITOR
T
DYNAIR PGM SWITCHER
DYNAIR SYNC MIXING AMPLIFIER
PGM
PGM VIDEO OUTPUT
EXT. MONITOR VIDEO
DYNAIR MONITOR SWITCHER
TELEMET SYNC. GENERATOR
S
B
HD
VD
TO SYSTEM
CONRAC 8" LINE PIX MONITOR
527 TEK SCOPE

Figure 4-5 Video System Block Schematic Diagram

an image in one corner (any corner) of the other image, or of wiping an image across the top, bottom, or either side of the other image. Furthermore, either camera may be used for the "inserted" image.

Three program monitors are provided, one for each of the cameras and one for the combined image provided by the effects generator. (In Figure 4-3 the two monitor screens to the left are for the individual cameras, the single screen in the center monitors the output from the effects generator.) Control equipment for the individual cameras are placed on the left-hand horizontal shelf. These include individual controls for camera pan, tilt, zoom, and aperture. Controls for the effects generator are mounted immediately above this shelf.

Included in the center section of the control console (see Figure 4-3) are a program switching system, a monitor switching system, and a control oscilloscope. These latter enable the operator to pre-set camera operation and to monitor picture signal wave-forms. The control oscilloscope (Tectronix type 527) is a precision device which enables the appropriately trained engineer to make picture signal voltage measurements during operation of the system.

Audio equipment is mounted and controlled in the right-hand third of the control console (see Figure 4-3). Two complete audio channels are provided, each of which is capable of mixing a number of signals. Speakers for both channels are provided and are mounted below the horizontal shelf.

The entire console mounts firmly in the transporting truc and may be operated either from within the truck or at a separate location. The horizontal shelf folds down to a vertical position when equipment is being transported.

Cables. Sufficient cables are provided to operate all facilities at a distance of 300 feet from the control console. Cables are of three types: (1) power cable consisting of a 4-conductor cable capable of supplying power to the system; (2) camera cables which serve to connect each camera unit with the control console and which contain conductors for both control and video signals; (3) microphone cables which serve to connect each microphone with the control console. (A separate microphone cabl must also be run to the Vega-Mike receiver.) When not in use cable are stored on reels in a trailer which tows behind the transporti truck.

The Truck. All of the above equipment plus spare parts, test equipment, chairs and the like fit within a small panel truc and trailer. Figure 4-6, pictures the equipment stored in the truk for transportation. Figure 4-7, presents a picture of the truck and trailer ready for the road. The truck used is a heavy duty Ford Econoline.

The truck itself is equipped for use as a mobile operatin center. When making recordings, operators sit at the control console in the body of the truck, and the portable tape recorder is placed on a small shelf immediately behind the driver's seat. Sinc recordings are made during both summer and winter, provision was

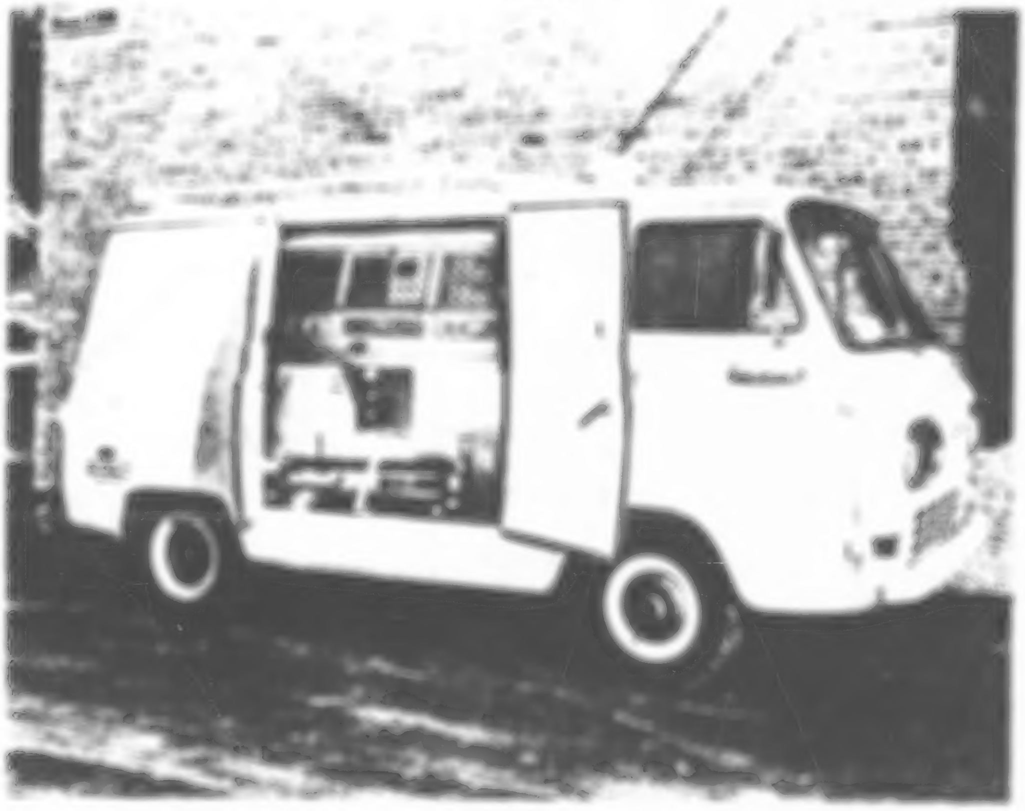

Figure 4-6 Truck with Equipment

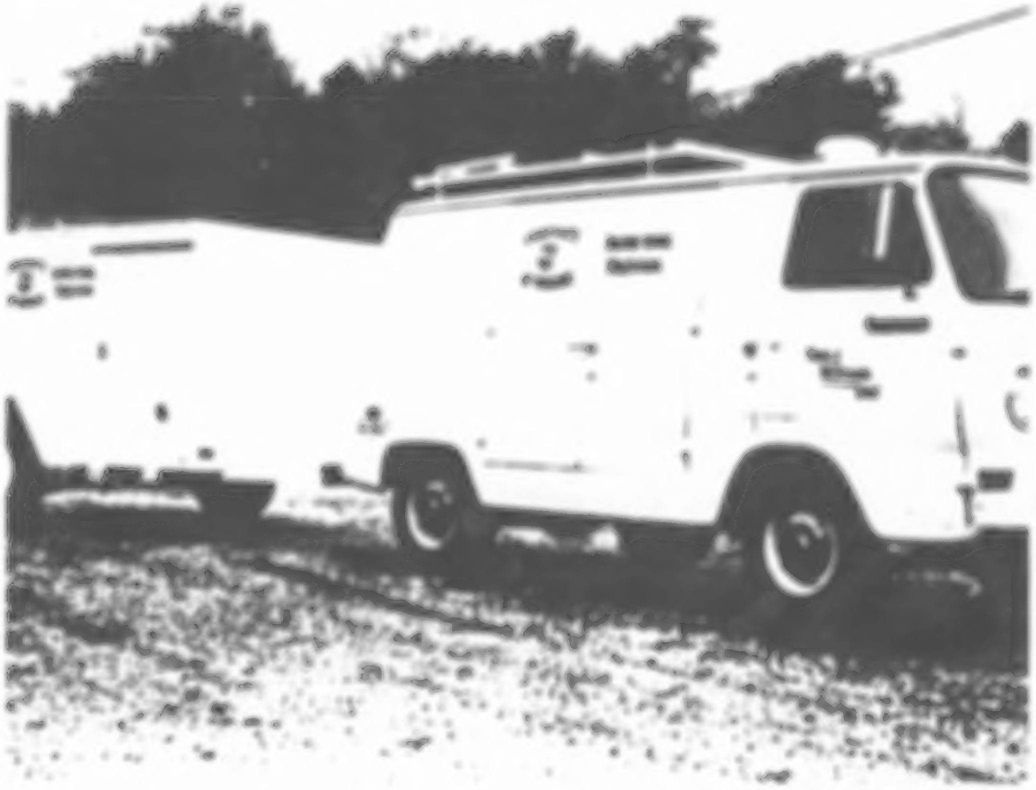

Figure 4-7 Truck and Trailer in Transportation Mode

made for adequately insulating and heating the vehicle. An efficient space heater is provided for winter operation down to zero fahrenheit, while an exhaust fan and white exterior paint keep the summer operating temperature within reasonable limits.

Provision is made for operation of the system with various types of electric current. Power may be taken from 115/230 volt single phase three wire service, or two phase wires and a neutral of 120/208 volt three phase four wire system. A line voltage compensator (autotransformer) is also provided which may be used to compensate for above or below normal line voltage. The system is also designed to operate from a gasoline motor-generator.

The truck is equipped with a ramp which is used with the side doors when loading or unloading the control console. (The ramp stores on the top of the truck when in transit.) A small door is also provided on the left side of the truck which allows access to the rear of the control console for attachment of power, video, and audio cables to the console. When the console is being operated from within the truck, it backs up to, and makes a weather-tight seal with this access door. When in transportation mode, all equipment is stored in the truck and is fastened to the floor by means of straps. Two seats are provided for both the driver and an assistant.

The trailer provides room for two types of equipment. All cables are stored on reels at the rear of the trailer and may be laid out in lengths appropriate to the task. Figure 4-7 shows the truck and trailer in transportation mode, while Figure 4-8

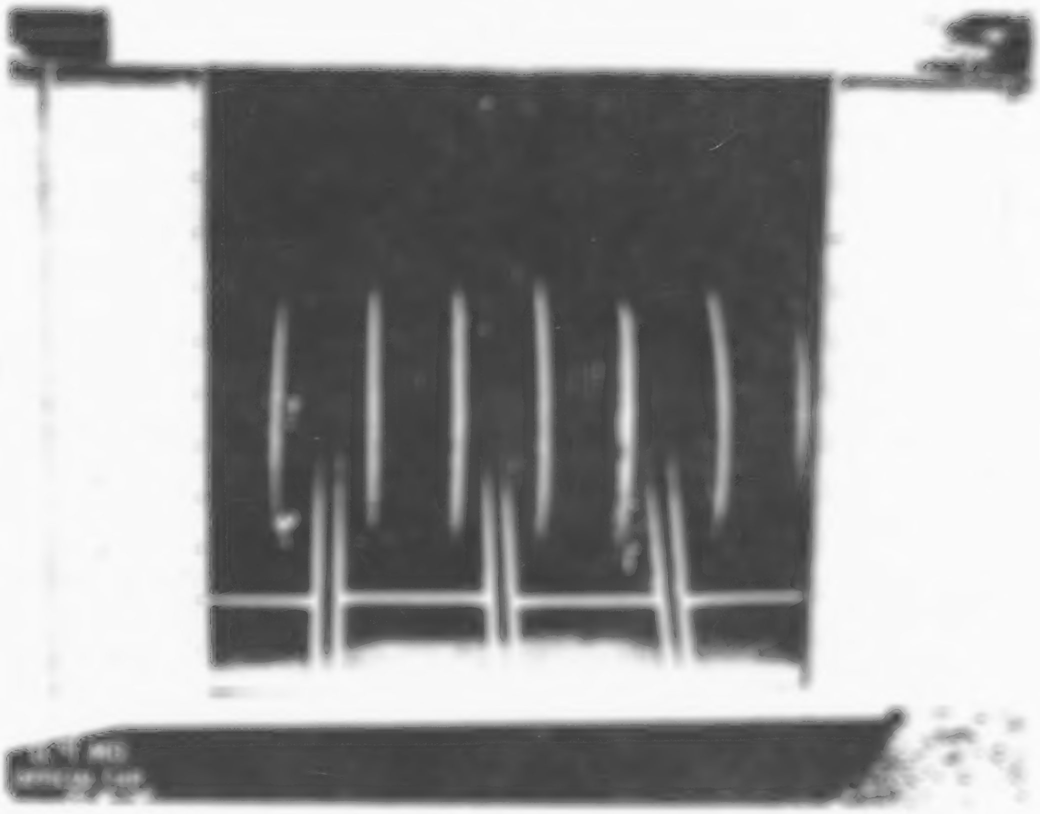

Figure 4-8 Back of Trailer (Showing Cable Storage)

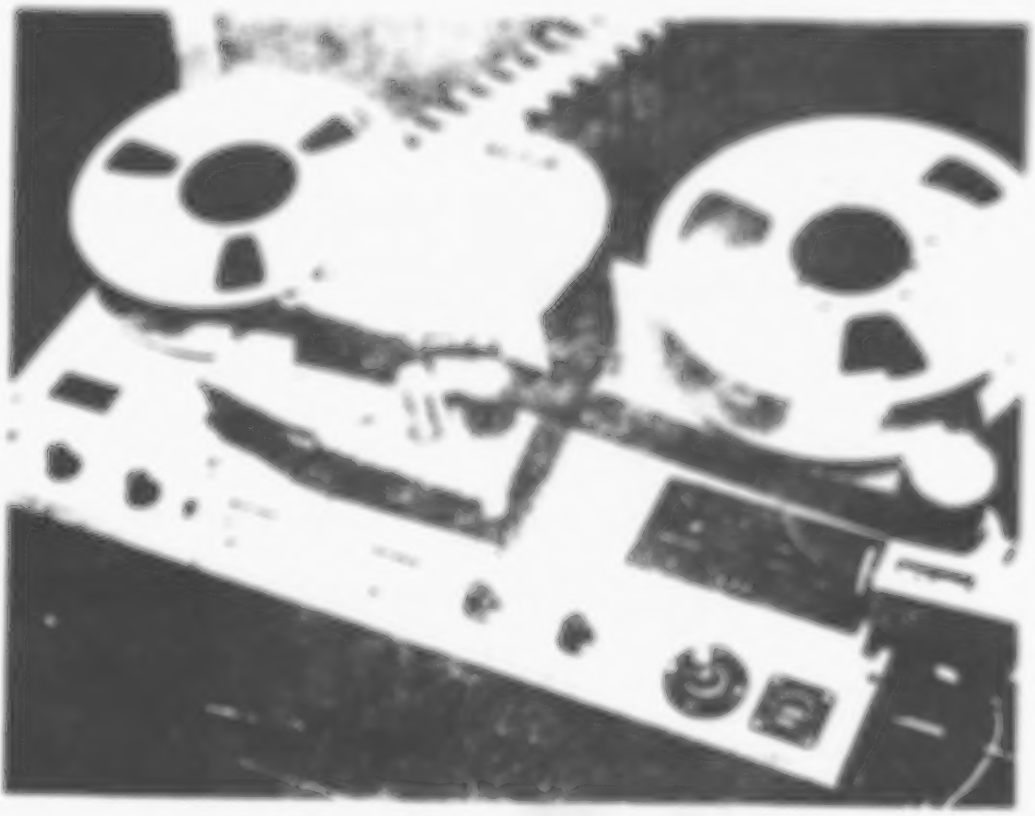

Figure 4-9 Modified Tape Recorder

which provide at least four hours of continuous recording time. The recorder has modes of operation similar to those of a portable audio recorder including "record," "play-back," "fast forward," and "fast rewind." These modes of operation are controlled through a "joy stick," and one can switch from any mode into any other with great flexibility and rapidity. The AMPEX also provides *two* audio channels which are recorded or played back simultaneously together with the video information. (In making classroom recordings, we use one audio channel for the teacher's microphone, and one for the four microphones suspended around the classroom.)[1]

We have made one minor modification in the AMPEX recorder. Provided with the standard machine is a revolutions counter which serves to index position on the tape. We had originally hoped to use this counter as a standard timing reference for the coding of interaction. However, the counter counts revolutions of the feed reel rather than tape footage and is mildly inaccurate. Its speed varies depending on whether the reel is nearly empty or nearly full. After exploring a number of possibilities, we decided to add an accurate footage counter pictures the back of the trailer showing storage reels. Ahead of the reels, space is provided in the trailer for installation of a gasoline motor-generator to provide current under field conditions.

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[1] Cheaper "helical wipe" tape recorders are available for as little as $1,500. Some of these use a one-inch wide tape, thus saving additional tape costs. However, the signal recorded by these less expensive recorders is less stable and has more noise, and none of them offers two sound channels. Since research videotapes must be scanned literally dozens of times, since high resolution of the visual image is mandatory, and since two sound channels are a necessity for the following complex interaction sequences, we recommend using the AMPEX 660B which records an image of broadcast quality.

The Portable Tape Recorder. In 1963 at least three portable tape recorders were introduced on the market for video recordings and there are now more than a dozen varieties available. These machines make use of a new type of recording system. The old system of video recording used a "vertical wipe" system which involved spinning a set of recording heads so as to make almost vertical tracks on a two-inch wide tape. This system involved a high tape speed (15 inches per second), consequently a high tape cost and an initial investment of over $50,000 for the tape recorder alone. The tape recorder was also a cumbersome machine suitable only for studio use. The new system involves a "helical wipe" with longer, slanted tracks drawn on two inch tape. This is accomplished by wrapping the tape around a large cylinder in a helical fashion. The tape speed used is a 3 3/4 inches per second, the recorder is portable, tape cost is approximately $68 per hour, and the initial investment was originally approximately $12,000. Now it would be approximately $8,000. The one disadvantage of the portable machine is that it makes recordings which are not quite up to broadcast standards. This disadvantage means that some definition of the image is lost, but the effect is minimal when using video recordings for research purposes.

The recorder actually used in our system is the AMPEX 660B. This machine uses 2 inch wide tape and accommodates 12 inch reels to the recorder. The Ampex Corporation makes a tape counter for use with their standard studio instrument which counts in seconds and minutes. Since tape speed for the 660B is 1/4 that of the studio machine, the unmodified footage counter actually counts in four-second units rather than one-second units. However, for our purpose, the four-second unit is a perfectly satisfactory timing referent. The tape counter was mounted in a carefully-machined bayonette mount and may be removed when its use is not desired.

Figure 4-9 pictures the modified AMPEX tape recorder. The tape counter is located at the right-front corner of the recorder.

Techniques for Making Recordings

We have developed standardized procedures for making videotape recordings that are worthwhile reviewing here.

As a rule, recordings may be made with not more than two operators, provided that both of them are male. In our recording sessions, one operator is a trained electronic engineer and the other a trained research assistant. Work within a particular school begins when contact is made between the research staff and school administrative personnel and teachers. As soon as we have agreed upon a schedule of classrooms to be visited, the engineer makes a visit to the school to establish the whereabout of the selected classrooms, parking space for the truck, sources of current, and routes for the laying of cables. (As a rule, cables are run from an outside location through the windows of the classroom to avoid interference with normal foot traffic in the school. Cables may be run from a ground-level location to a basement, first, or second floor classroom. When running to a third or fourth floor location, we rope cables into a suspended bundle in order to prevent stretching.)

Classroom operations begin the day *prior* to actual recording. In order to get pupils (and the teacher) "used" to the recording equipment, "dummy" camera boxes and microphones are installed in the classroom early in the morning of the day prior to actual recording. "Dummy" boxes are completely like the real camera boxes except that they do not have a camera inside them. Cables are run from "dummy" boxes and microphone shells so that equipment in the classroom appears identical with the equipment used on the following day when recordings are actually being made.

The next day, well before school begins, the cameras are placed in the boxes and tests of the equipment are run. To make the day's recordings, one operator usually monitors and controls the video cameras while the other operator monitors the microphone gain controls. Normally the system remains on throughout the day, and tape records are made of only those class hours desired. (We have attempted to make recordings in two different classrooms during a single day, but the problems involved in setting up twice are difficult to meet.) Each evening the system is dismantled, and cameras, microphones, and other delicate equipment if they are not to be set up elsewhere immediately are stored in the truck overnight.

Teacher and pupil reactions to the recording equipment depend on individual personality, but are normally minimal. Teachers are always volunteers (although considerable encouragement is given to the teacher in order to assure representative samples). Teachers are told that under no circumstances will any use be made of the recordings other than for research purposes or except by written permission given by them. We have offered, but so far have not been asked, to give a "show" for PTA groups and the like. Teachers, however, have always been encouraged to view tapes made of their morning classes during the noon break -- when they are invited to the truck for the purpose.[1] Pupil reaction to the cameras appears minimal. Pupils are told about the system and its purposes, sometimes gather around the truck during recess. In the classroom, however, they appear to disregard the equipment.[2]

It should be emphasized that operation of the system requires the presence of a trained electronic engineer. Not only must the cameras and associated video equipment be adjusted each day, but a variety of minor mechanical and electronic difficulties have appeared to plague recording sessions. For the most part, these have been fixed in the field, and our "down time" has averaged less than 2% of sessions actually scheduled. This would have been quite impossible had we not used a trained engineer.

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[1] We also have used these same occasions as opportunities for supplementary interviewing of teachers.

[2] Among the wide range of activity that has now been recorded there are instances of activity contrary to accepted teaching practice, common morality, and (in a few cases) the law.

Discussion

How does this system for data collection compare with specifications for an "ideal" system? How does it compare, for example, with a system based on sound motion pictures or a permanently-based system using installed one-way mirrors? How might the system be improved?

When we first considered the problem of making permanent recordings of classroom interaction we set ourselves the task of approximating a variety of ideal specifications for a recording system. These suggested that the system should:

1. Provide a frozen, objective, and accurate record of all interaction within the classroom.

2. Operate with a minimum of disruption to interaction and, in particular, without the presence of an observer or bulky instruments.

3. Be of simple and reliable construction, be easy to operate and cost very little.

4. Operate in a variety of settings (both in and out of doors) with minimal disruption to either participants or the setting itself.

5. Provide synchronized visual and audial records, and at least two visual perspectives and two or more audio channels.

6. Make provisions for recording visual and voice signals from all actors and provide control over ambient noise.

7. Make permanent recordings which can quickly, conveniently, and repeatedly be played back for coding purposes.

Although not a perfect system, the equipment and procedures we have adopted for the research comes close to meeting these specifications. Let us review them in detail.

Operation and Disruption. The system as it stands is capable of recording the great majority of interaction events in the classroom. It does not handle well the non-public forms of interaction (such as the whispered conversation) and, when the wide angle lense is used, has some difficulty in resolving the faces of pupils who are at maximal distances from the camera. The recordings obtained, however, are frozen, reasonably objective, and of considerable accuracy. We presume that the presence of the recording equipment in the classroom has "some" effects, although since the equipment is non-human, non-reactive, non-moving, and non-attractive (or frightening) we presume that its impact is little and tends to disappear with time. For extended observations of a classroom (for example, for longitudinal studies of a semester), we would recommend screening the equipment.

Reliability and Cost. The recording system is reasonably reliable and easy to operate. It does, however, require the presence of a trained engineer for its maintenance, and the basic investment in equipment is substantial. It is instructive to compare the cost of videotape recordings made with this system with those using one-inch wide videotape, and 35, 16, and 8 mm. motion picture systems. Interestingly, only the one-inch wide videotape and 8 mm motion picture systems are really cheaper than the system we have described. 35 mm. motion pictures are several times as expensive in both capital cost and per hour expenses for recordings. 16 mm motion pictures involve a smaller capital outlay, but the per hour cost is greater than for videotape. Both the 8 mm motion picture system and the one-inch wide videotape system, however, do not have the signal clarity of the present system. Neither do they provide two sound channels. The major disadvantage of the videotape system, in fact, appears to be that the industry has not settled on a standard. Consequently, there is little compatibility between the different recording systems.

Operational Flexibility. The system appears to be highly flexible in its ability to accommodate to various settings. Our major need is for electric current, and even this need may be accommodated in field conditions by using a gasoline-powered generator in the forward compartment of the cable trailer. At one time we contemplated taking the equipment overseas to make recordings in a country in which there is only 50 cycle current available. (American standard is 60 cycle.) Under these conditions we would have used a field generator exclusively.

The system is not at present waterproofed, and should cameras and microphones have to be used in the rain some modifications would be needed. In addition, since 1963 an air conditioner has been added to the control truck to facilitate operations on hot, summer days.

Recording Synchronization. The recordings made are completely synchronized, two visual perspectives are provided, and two audio channels are available and can be controlled at will.

Noise. The problem of visual noise is but minimal in the system. Recordings have been made with room lighting in all cases, and the only difficulties we have had with the visual record has been when tracking across a brightly lighted window when there is no internal lighting in the classroom. (A brief after-image "trails" behind the window, but this disappears from the record within a second or two.)

The problem of audio noise is much greater. The average classroom comprises a wooden cube which has little sound absorbing capacity. Whatever acoustic properties it has are exacerbated, in fact, by the presence of numerous hard surfaces such as chalk boards, windows, tile floors, and the like. As a result, ambient noise can be very high. In some of the classrooms we have entered it reached 60 db![1] As a result, while recordings from the teacher's microphone are inevitably excellent, we find that as many as 20 or 30 percent of the pupil's communications are unintelligible to us -- particularly those that were delivered *soto voca*. Visual cues suggest to us, however, that many of these same communications were not in fact understood by others in the classroom either! No wonder teachers are often taught to use "the big voice."

We have attempted a variety of solutions for the problem of audio noise. Assuming that most noise was generated from the floor, we have inverted the hanging microphones in the classroom. We have tried "clipping" the audio signal. We have even attempted to muffle the sounds of the classroom by placing strips of felt under chairs and feet. This latter attempt was stopped short, however, when we had an opportunity to make an experimental recording in a carpeted classroom. It was our informal observation that in this setting voices were indeed intelligible, but that the structural properties of the classroom changed! The central group tended to persist for longer periods of time, pupils exhibited less deviancy, there was a longer attention span, etc. Regrettably, we concluded that if we were to retain a natural classroom condition our efforts to improve intelligibility should be confined to our own equipment and not to adjusting the acoustical properties of the room.

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[1] We also drew up for future investigation some interesting hypotheses about the salubrious effects of classroom carpeting -- which could not yet be tested in our current study.

We believe, however, that some improvement in the audio noise problem can be obtained by designing fan-shaped microphone-horns that may be placed horizontally at the sides of the classroom. These horns will tend to block out noise from the floor and ceiling while allowing speech to be caught. If these modifications are made, we hope to be able to pick up most of the remaining pupil communications. Whether it may be concluded that these are in fact understood by other members of the classroom who are further away will remain a mystery.

Coding Ease. Videotape recordings are nearly ideal for coding purposes, as they may be played back instantly and may be advanced or rewound with great speed. In contrast with motion picture film videotape does not have to be developed, and with no sprocket holes to wear out videotape is much more impervious to wear. Videotape may be re-used if desired.

Our present system for indexing the classroom hour can be improved upon. It will be recalled that we are using a standard, footage counter around which the videotape is wound. Not only is it difficult for the coder to see the numbers displayed at this counter, but there is occasional slippage between the tape and the counter spool, particularly during stop-and-start and high-speed, fast-forward and rewind operations. As a result, it is necessary to re-index the footage counter against some classroom event approximately once every two minutes during the class hour and then to provide a supplementary coding book in which these classroom events and the "correct" setting for the footage counter are set down.

A far better system would be to place a visual or audio indexing signal on the tape itself. This might be done either at the time the classroom recording was made (in which case the equipment for placing the signal would have to be included within the control truck) or at a later date. One system we have thought of would be to place a visual timing signal in some unused portion of the image -- either in the form of a superimposed clock face or in digital information. (Systems for such a purpose are now available at moderate cost.) However, a cheaper system would be to use the clipped portion of the sound signal from the pupil microphones for an audio indexing signal. Ten distinct tones, recorded in sequential bursts, might be placed on the tape every four seconds for subsequent visual display with a set of nixie tubes at the play-back unit. Such a system would cost approximately a thousand dollars, and recording of the indexing signal could be made in the control truck. We recommend that such a modification be made.

Summary. The present system, then, meets most of the requirements for making videotapes of actual classroom interaction. It is certainly a more flexible system than one based on film, and -- with modification -- appears to meet most research needs. Its major disadvantages are its cost, bulk, and the need to employ an electronic engineer in its operation.

Techniques of Data Processing

Videotape recordings, though permanent, are nevertheless "raw" in that they must be translated into a data form suitable for tabulation and processing. In this section of the chapter we shall review the techniques developed for handling videotape data including our physical facilities, methods of transcription, unitizing, coding, coding procedures, reliability, and data analysis. Again, a brief discussion of our methods is also presented.

Play-Back Facilities

It is necessary to provide facilities to play back video and audio signals when transcribing and coding interaction responses from classroom recordings. (Play-back is provided, of course, at the recording console, but the console is often needed for making other recordings.) The facilities we have provided permit observation and coding of interaction by groups of up to a half dozen observers.

Video play-back is accomplished through a standard CONRAC 24 inch monitor set similar to those used in classroom television. This set is mounted on a plywood stand at an appropriate angle for viewing. Audio play-back is accomplished through one of two means. When one or two observers are using the equipment, audio signals are fed to a pair of headsets. The headsets each connect to a switching box which allows the user to send audio signals from either channel alone or both channels stereophonically to the two ear-phones. Individual controls are provided for each headset. When more than two observers use the equipment, twin Bogen amplifiers are provided which feed twin speakers (one for each channel) mounted directly below the CONRAC monitor on the plywood stand. To provide both flexibility and management of connecting cords, the tape recorder, amplifiers, and connecting isolation transformers are mounted on a wheeled cart which is then placed so that the operator can reach the "joy stick" of the recorder easily. Figure 4-10 pictures play-back operation.

It is possible to use the equipment pictured in Figure 4-10 for either transcribing or coding. When transcriptions are being made, the operator sits in front of an IBM Selectric typewriter (one in which typing is done with a "bouncing ball" and the carriage does not move) and makes transcriptions on continuous rolls of computer output paper. When coding is being done the observer works with coding sheets, transcriptions, and other required materials. Generally, both transcription and coding require multiple-viewing of some action sequences, so that the observer

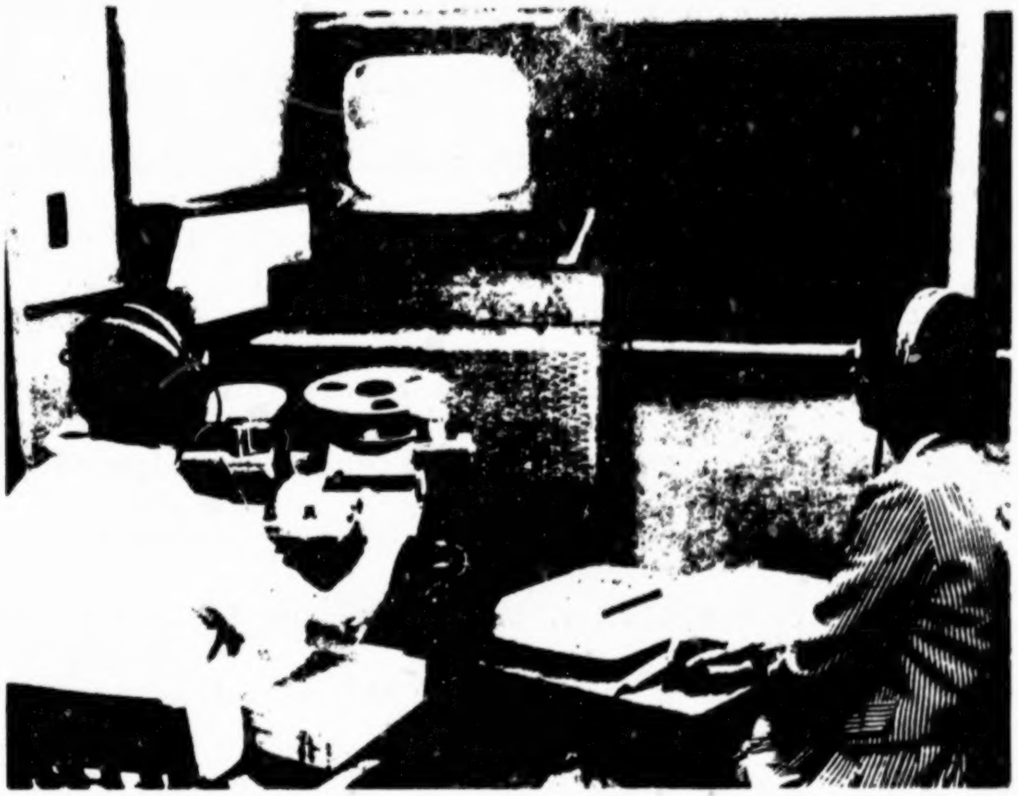

Figure 4-10 Play-Back Facilities

must start, stop, and back-up the equipment frequently.

Transcription

Transcription is the preparation of a typescript that is a written transliteration of the verbal component of classroom interaction. Although it is possible for the trained typist to prepare transcriptions of classroom interaction that use an expanded alphabet of linguistic symbols, to date the transcriptions we have prepared have been in standard orthography only. Examples of such transcriptions may be found in Figures 4-11, 4-12, and 4-13. Note that in the right-hand column of these figures we have included the indexing count used in assembling codes.

The first transcript is of an eleventh-grade classroom in which the subject is geometry.

Figure 4-11

	Episode Count
Okay, now what do you start out with then? Have I drawn a good picture of what we start out with in our discussion?	201.1
Uhhumm, no.	
No, so what should I start out with?	
A square.	
Right, you should start this out with a square. And what's the case? That contained in this square is what? How much material?	204.2
12 feet square.	
12 feet square. How do you believe this is 12 feet on each side, or that the area is, uh, contains 12 square feet? (Pause) Well, I mean this is just, uh,	208.2
we have to understand what the symbolism is, that the author uses, right?	211.4

Episode Count

How have you had this in physics? Because these are really physics problems, aren't they. I mean they are applications of mathematics. We have to abide by what your understanding is in your
physics class. Who has or is taking
physics? All right Nancy, do you feel 215.4
competent to discuss physics (class
laughs) in here? You don't

We haven't had this (inaudible)

You haven't? You take Physics Sue? 218.1

I took it last year.

Oh, you took it last year, and did you never come across this?

Feet squares?

Yeah 220.2

(Several students speak)

What?

We came across that. We came
across feet squares. 221.1

Feet squares? O.K. Well, what is your 222.3
reaction when you see feet squares? 222.4

Well like in a measurement and if you square that you just square the .. you just, you just ...

Oh, for instance you come across it this 225.3
way? (writes on board)

Yes

Two feet squared? Are you taking Physics too Patty?

Yes

Now, what does this mean? This means that you have, the unit is square feet. Right?

Episode Count

Very good. O.K. So then is doesn't mean this then does it? (writes on board)

No

It doesn't mean that you take 2 feet and square it. And so if this is a notation, then we're taking cardboard, here, and is it the case that this cardboard is twelve feet, isn't feet the unit we are talking about?

Yes

Feet on each side, or is it the case
that the whole area ... of, ... contains 234.1
twelve square feet. Patty? 234.4

The whole area.

Right. Now is it the case that if we are
going to have available to us, uh, twelve
square feet that this problem could have
just this kind of shape to the twelve
square feet of cardboard, or it could be a
square, or a rectangle with 2 feet by 6
foot .. Is this right? In other words it
is true that we could build up this rect-
angular solid or rectangular box, right,
just by taking with work of this shape
and maybe we might have to divide this
into little spaces, might we not? It
might not be that the dimension will just 248.3
come out to be one foot. Uh, that's all
right O.K.? So David would you like to
tell us the problem again?

Uh, we're trying to make a rectangular box with a square base, and you have 12 feet square of cardboard to work with.

Alright. We want to end up with it right? 255.2
And is this box supposed to open on top or
closed on top or does it say?

Open on top..

In other words the area that we are talking about is twelve square feet, will not include this base, it will include this base

	Episode Count
plus all these sides, Right? (Cough) So we have material in which to give. How are we going to do this? (Pause) Alright Nancy what's your suggestion?	301.3 304.1
Well, it's just that (inaudible) equation to set up (inaudible) in terms of each other.	
So what do we know about the lengths of the edges here?	
We know that uh, the base, multiply by the base.	
Right. So this could be say, W-W if we just, or S. We usually	

In the second illustrative transcript a grade I class is working with Cuisennaire rods during an arithmetic lesson. The teacher is questioning the children. The period selected covers two minutes and twenty-two seconds of real time.

Figure 4-12

	Episode Count
We're working on five. What are we trying to do? Tell me.	
(One pupil talks to another (inaudible))	
What are we trying to do? John?	1800.1
Equal five with only two ..	1800.4
We're trying to see how many ways we can say .. Brian Gleason, This number; what is this number?	1802.1 1802.2
Four.	1802.4
Five.	
We're trying to see how many ways we can equal ...	1803.4

Episode Count

Five.

All right, how many ways did you find to equal five?

(Inaudible) 1805.1

Found one.

Four....

All right, now this is easy enough for 1805.4 1806.1
Brian to do. Now, come on. This is what
I want Brian to learn to do. What do I 1806.1
want Brian to learn to do? To .. 1807.4

(inaudible)

Think all by himself? All right, take this rod. Now take two rods. Find some two .. two rods to put end to end.

I have five, because yellow plus nothing is ..

For instance, let's take two rods and put them end to end. Do they equal ... are they the same size as the yellow rod? All right, let's try some other, try some other rods to.. to put with that. Do they equal the yellow rod?

No. (yes)

All right, find another one and .. find one. 1815.2
Let's see this one. What one do you think would go next to that one.

.. red plus green ..

Does that equal the yellow rod? How can you 1817.4
find another one that can do that?

Can I take yellow?

No, we already have a yellow. I'd take another one. Try them and put them end to end and see if they equal the yellow rod. (Child tries different ones) Does that equal
the yellow rod? 1821.3

No.

No. What were you going to do? Take that
away. Now try another rod with it. Does
that equal it? 1823.1

Yes.

Yes. Now let's see. We've got white plus purple equals yellow, don't we? All right, see if you can do this again. You could do this (teacher moves rods). Now then. Do you want to know something kind of fun?

What?

If you wanted to change these to numbers, do you know what you could do?

What?

You could go like this (teacher moves rods)
Let's see, how many is this? One, two .. 1828.2
how many does it take me to put on here? All
right, what would that be

(Inaudible) number ..

What would it be?

.. six?

Count them and tell me what it would be .. Yes?

(child's name) copied mine. 1831.4

Oh, I don't think so.

(Inaudible) 1832.2

Well, I don't think he will any more. All 1833.1
right this is five; all right. Now find 1833.3
out how many the purple one is by putting
how many is that?

Seven (?)

All right, so .. you know a combination. 1835.3
One plus four equals what?

In the final example transcript, a Grade VI social studies lesson on map making is in progress. During the lesson a visitor enters the room and engages the teacher briefly in private discussion.

Figure 4-13

	Episode Count
Yes, they fly over this at a steady	905.1
altitude, and, uh photograph at	906.3
that altitude, the plane stays stable.	907.1
(Pause while teacher talks to someone	907.4
who entered the room) Uh ... this plane	909.3 910.3
flies at the same altitude, so that they	910.4
can get a true picture of these things	911.2 911.3
as they fly over, because they'll all be	
from the same viewpoint. I remember one	913.1
time I was working for the Department of	
Agriculture and we used to get aerial	
photographs, you see .. aerial maps,	
actual photographs and they didn't redraw	
them, but the plane would take two pictures,	
you see it had two cameras, and I don't	
know how they were stationed .. maybe one	
in each wing or something, but we had an	
instrument that looked something like a	
microscope. You'd look through and, uh,	
boy everything was 3-D. You could act-	
ually see the furrows in the fields that	
were plowed, and so on, and you'd see the	
trees .. you knew where each tree was and	
so on. Then we'd take these maps, I	
wouldn't, but some of our men would and	
uh, and they'd draw contour lines on	
these things, you see, with uh, with white	923.1
ink, and make a white line. Yeah?	923.4
(bell rings through last part)	
Uh, these, uh, microscopes,	
or whatever you call them..	
had they, uh, very strong	924.1
lenses in them?	
Oh, I don't know how strong they were, uh,	
I think it's just a .. gadget that had a	
prism in it so it appeared as one image,	
rather than two, you see. I think the	

Episode Count

main thing is to get these two to go together so you think you're looking at one .. it appears that you're looking at one, rather than two images, and you've seen this, too, with a viewmaster does the same thing, doesn't it? There are two photographs taken close together; how many of you have a viewmaster viewer at home? (show of 931.4
hands) Quite a few of you. 932.1

Some of them are three dimensional too

And this works the same way you see, and this certainly isn't expensive.. Yeah?

My sister has a three inch 934.2
(inaudible) flat piece of paper, and you look through this little (inaudible)

She got that when she was in this room, didn't she? Yeah, we sent off for these .. I'm not so sure they still have these, but uh, we can send off for a map of the Grand Canyon .. I think they cost about 50 cents, didn't they, and then you get a little piece of cardboard with a little, uh, red cellophane on one side, and blue cellophane on the other, and you look through this, and by golly, you look like you're going to fall into the canyon there doesn't it?

All the things and uh rocks come up, too and ..

Boy, they come right on up .. and you can switch the thing the other way and they go the opposite way. Did you try that .. fiddle around with the thing? Okay. So that this is what it boils down 944.3
to .. two images, and then your mind kind 945.2
of throws them together and then they give a 3-D effect.

Several comments should be made about the process of transcribing. It is readily apparent from the example transcriptions that classroom conversation is not a thing of literary or logical beauty. Exchanges between teachers and pupils appear, on occasions, to be almost incoherent. In part this is because the verbal exchanges being transcribed are, in the real classroom, being supplemented by gesture and other symbols which also carry meaning. But in part it is also a reflection of the fact that verbal discourse follows other rules than does written text.

It would also seem apparent that the teacher dominates the classroom situation. He (she) talks more than any other single member and talks with the apparent conviction that authority resides in the teacher position. This observation suggests one of the hidden conditions that makes possible the transcribing of classroom discourse at all. In most classrooms, most of the time, there is but one stream of verbal exchange (dominated and controlled by the teacher). Should there be in fact a multiplicity of exchanges -- as there sometimes is -- the process of transcription becomes difficult. We have, in fact, experimented with a variety of solutions for the multiple-stream classroom -- e.g., parallel transcriptions -- but have not yet hit upon an acceptable procedure. In fact, given that we have only two sound tracks to work from, it is difficult to recognize intelligibility from more than two streams of verbal exchange.

Another problem exemplified by these transcriptions is that of standard orthographic approximations to verbal information. How much should the typist "clean up" the dialogue? Should "ugh," "um," humming, and whistling be transcribed? Should elisions be straightened out? Should partial sentences be "completed"? This is a severe problem, particularly for those who would choose to code from transcriptions rather than from the videotape recording itself.

In fact, however, in the study reported here we did not code from transcriptions. Rather, transcriptions were prepared from only a half dozen classroom hours and were used solely for code development. The actual coding processes adopted required of coders that they work directly with the videotape play-back unit without benefit of transcription. Nevertheless, we anticipate that certain types of coding -- for example, semantic codes -- might well be facilitated by transcriptions. For those interested, we estimate that the average trained typist will require approximately four units of time to transcribe each unit of real time from the classroom. For example, four typing hours should be required to transcribe a typical classroom hour.

Coding Procedures

In traditional methods, coding involves two steps: unitizing -- the identification of units for coding, and encoding -- the assigning of coding categories, represented by such symbols as numbers or letters, to the previously identified units. Such a distinction requires, however, that units to be coded be concretely identified in and of themselves. For example, "sentences" may be unitized, provided there are well-worked-out rules for the identification of sentences. Similarly, the "episodes" of Barker and Wright (1955) may be identified as concrete units for subsequent coding. In Chapter III we suggested, however, that concrete units are not appropriate for the analysis of classroom activities. Rather, in the study reported here we have adopted a different strategy -- one in which a variety of units are recognized, depending on the coding facets engaging the coder's attention at a given moment.

Unitizing, thus, requires the coder's recognition of a change in the activity condition under examination. However, when the boundary of a coding unit is recognized the coder can at the same moment assign a code category to the new classroom activity condition whose existence has just been recognized. In order to facilitate this process of unit recognition and coding, a special coding sheet was designed. An example of this coding sheet is to be found in Figure 4-14.

The sheet is divided into four major, horizontal categories -- representing, respectively, the central group, the first peripheral group, the second peripheral group, and non-involved persons. Within each category there are three minor headings: personnel and location (which together make up the structural distinctions) and function.

Figure 4-14 Sample Coding Sheet Showing Codes

Teacher Code Number____________

	Central Group							Peripheral #1							Peripheral #2							Non-Involved	
	Personnel			Location			Function	Personnel			Location			Function	Personnel			Location			Function	Pers.	Location
	E	T	A	E	T	A		E	T	A	E	T	A		E	T	A	E	T	A			
29:00	3	6	3	11	11	11	31																
:01																							
4	2	2	7	33	33	11	21															2	11
:02																							
3	2	1	4	33	54	11	21	2	2		43	33										2	54
4	3	1	4	11	54	11	21	2	2		43	33										3	54
:03																							
3	1	2	4	54	33	11	21															3	54
4	6	2	4	11	33	11	21															2	11
:04																							
1	2	2	7	53	24	11	21*															2	11
:05																							
2	2	7	53		24	11	22	2	2		43	43											
:06																							

* Indicates change of subject matter when function code does not also change.

Along the left-hand margin are numbers representing "seconds" as indicated on the index timer. Recall, however, that the timer revolved at but a quarter of real-time speed; hence each index-timed second in fact took four real-time seconds to pass. For this reason, we allowed on the coding sheet for the breaking up of each index-timed second into four parts corresponding to the first, second, third, and fourth real-time seconds it contained. In the examples given in Figure 4-14, the first coded episode began at index-time 29:00.1 (during the first second after the index-timer read 29:00), the second at 29:01.4, etc. Each coding sheet dealt with six index-timed seconds or 24 seconds of real time. One hundred coding sheets would thus take care of 40 minutes of real time.

Turning once again to Figure 4-14, it may be observed that various codes are found under the minor headings. Codes for personnel involve an identification of role allocation for the three, possible roles within each group -- emitter, target, and audience. Codes for location involve an identification of vertical and horizontal role location for emitter, target, and audience in each group. Codes for function were given to each group whenever it existed and the topic of communication could be ascertained by the coder. Non-involved individuals were coded for role allocation and role location only.

The codes for role allocation, location, and function are given in Figures 3-3, 3-5, and 3-6 from Chapter III respectively. If we turn to these tables, a direct interpretation of the example episodes coded in Figure 4-14 may be made. For example, in the first episode an emitter consisting of "3 -- a Pupil Segment" is in interaction with a target consisting of "6 -- a Pupil Segment plus the Teacher" and is witnessed by an audience of "3 -- a Pupil Segment." These three roles are all located at "11 -- Diffuse-Diffuse", or in other words, scattered throughout the classroom. The interaction concerned itself with "31 -- Intellectualization about Relevant Subject Matter." Finally, there were no peripheral groups nor non-involved individuals at the time.

Coders who in fact made entries on forms similar to the one displayed in Figure 4-14 generally operated from the coding definitions as given in Chapter III. However, some supplementary coding rules were needed from time to time, and these are reproduced in Appendix B. Generally, non-coded columns indicate either that the group involved did not exist or that the particular information called for was obscure. For example, in Figure 4-14, the first peripheral group did not exist until 29:02.3, then ceased to exist again at 29:03.3. By convention, if but one activity characteristic changed at a given episode boundary, all other remaining characteristics (which did not change) had to be recoded in the next line of information. By the same token, a new line of information always[1] meant that one of the code categories had changed -- that an episode boundary had been reached.

Although it was theoretically possible for coders to rate all of the facets given on this coding sheet with but a single session with the class hour, in practice we found it advisable for coders to rate either the structural or functional codes at one sitting, but not both at the same time. In all cases the structural codes were entered first, then the functional codes were entered by the same coder who took particular care to match the timing of the functional and structural records. Although in our initial runs we found ourselves spending more than twenty hours of coding time for each class hour, we were eventually able to cut this figure more than in half. However, difficulties with the index-timer kept our best coding time to around ten hours of coding for each class hour examined.

The astute reader may have noted that communication structure, role structures for each of the groups, teacher role assignment, and teacher positional location were not coded directly. This latter information is hidden in the codes that have been given, of course. For example, in the first episode appearing in Figure 4-14, the code for communication structure would be "01 -- Central Group Only," role structure for the central group would be "3 -- Emitter plus Target plus Audience," teacher role assignment would be "2 -- Teacher Target of Central Group," and teacher positional location would be "11 -- Diffuse-Diffuse." Needless to say, these latter judgments can be made mechanically from the codes for role allocation and location, they were in fact recoded by computer during the data analysis.

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[1] One exception to this rule was allowed. When the "topic" of the discussion was changed with no shift in functional code no new episode was forced. The functional code was "starred" at that point, however.

Coding Reliability

Medley and Mitzel (1963) have pointed out that there is enormous variability in the reported reliability of various classroom observation techniques. Much of the unreliability is undoubtedly a function of the need for the observer who is physically present in the classroom to make rapid judgments of a complex nature. This need is obviated when one has a good videotape record, and reliability then becomes a function of the clarity of the videotape and whether the judgments required of the coder can be made at all or not.

In selecting a procedure for testing reliability of our coding procedures it was decided to compare scores on the major variable classes as they were coded by independent observers using the same sample classrooms. Three videotapes were used, one each from grades one, six, and eleven. Eight minutes of real tape time were selected for reliability analysis beginning six minutes after the start of the lesson. Four coders were assessed for reliability, and each was asked to code the twenty-four minutes of "test" tape independently.

Inter-observer reliability among all possible pairs of observers was calculated as a proportion of agreement score defined by the following formula:

$$R = \frac{A - (\frac{1}{N - 1} \cdot D)}{A + D}$$

where A = sum of time (in seconds) in which the pair of coders was in agreement, D = sum of time in which the pair of coders was in disagreement, N = the number of tolerated coding categories. Note the addition of a correctional factor $(\frac{1}{N - 1})$ that was added because two coders with no reliability would still tend to agree with one another in 1/N proportion of the cases by chance alone. This correction permits the computed proportion of agreement to diminish to nought if the coding is random. Because of the great number of potential codes allowable for role allocation (as a three-column field), the correction factor was not used in computing its reliability data.

Figure 4-15 below presents a summary of seven inter-coder reliability averages for each of the three grade levels. It will be noted that although seven variable classes are featured in the figure, reliability information on peripheral groups is lacking. (Too little peripheral group information appeared in the twenty-four "test" minutes for reliability computation.)

It can be seen in Figure 4-15 that consistency seems in part to be a function of the grade level of the class observed. Understandably, the more static secondary class yields greatest reliability. Lowest reliability is recorded for the functional code. In view of the greater degree of interpretative sophistication required for this variable class, this finding is not unexpected. The perfect

Figure 4-15

Mean Inter-coder Reliability

Variable Class	Grades			Average all Grades
	XI	VI	I	
Communication Structure	.988	.971	.494	.818
Function -Cen.	.825	.572	.508	.635
-Per$_1$	--	--	--	--
-Per$_2$	--	--	--	--
Role Structure -Cen.	.922	.821	.732	.825
-Per$_1$	--	--	--	--
-Per$_2$	--	--	--	--
Role Allocation-Cen.	.906	.768	.568	.747
-Per$_1$	--	--	--	--
-Per$_2$	--	--	--	--
Teacher Role Assignment	.918	.806	.812	.845
Location:				
Central-Emitter	.931	.709	.638	.759
Central-Target	.930	.615	.776	.774
Central-Audience	1.000	1.000	1.000	1.000
Per$_1$-Emitter	--	--	--	--
Per$_1$-Target	--	--	--	--
Per$_1$-Audience	--	--	--	--
Per$_2$-Emitter	--	--	--	--
Per$_2$-Target	--	--	--	--
Per$_2$-Audience	--	--	--	--
Teacher	.931	.709	.638	.759

reliability for central audience location appears striking at first sight. However, it is undoubtedly due to the fact that "large" audiences are almost inevitably classified "11 -- Diffuse-Diffuse."

It should also be noted that the figures presented in Figure 4-14 were in fact averages prepared from paired comparisons among four, separate coders. In fact, one of the coders joined the project at a late date and demonstrated consistent lack of reliability when compared with each of the others. Details of the pair-comparisons for reliability may be found in Appendix C. When the discrepant coder is eliminated, reliability among those coders remaining is substantially increased.

Are these reliability figures acceptable? No simple answer can be given to this question. With one exception, they but approach unity, and some of the figures given (for function, particularly at the lower grade levels) suggest confusion on the part of the coders. However, on the whole, the average figures reported in Figure 4-15 seem acceptable. This interpretation may be strengthened if we examine the basis for computing reliability. Figure 4-15 in fact reports reliability figures for time-in-agreement, a strict criterion indeed when one recalls how difficult it was to obtain exact agreement in time using the poor time-indexing system adopted for this study. A more common but less rigorous method of figuring reliability would be to assess the percentage of coder agreement on the existence of episodes with given classifications. As will be seen in later chapters, data have been presented on both of these bases.

Data Analysis

Analysis of these coded data was relatively straightforward. First, IBM cards were punched representing each coded line from the coding sheets. Whenever blank spaces were encountered, "0" or "00" was punched onto the cards, so that all fields had a non-empty entry. Each card, thus, represented a classroom episode, and a set of cards -- in sequence -- represented the states of classroom activities for a given class hour. Onto each card was also coded the index-time number representing the second when the episode represented began.

It is useful to take a look at the various dependent variables that were thus available for analysis. Figure 4-16 presents a listing of the 21 dependent variable fields, their field codes, and the columns on the IBM card in which they were punched.

Figure 4-16. Dependent variable fields.

Field Code	Column on Card	Name of Field
01	6,7,8	Role allocation central group
02	9,10	Emitter location central group
03	11,12	Target location, central group
04	13,14	Audience location, central group
05	16,17	Function, central group
06*		
07	21	Role structure, central group
08	24,25	Communication structure
09	26,27,28	Role allocation, peripheral 1 group
10	29,30	Emitter location, peripheral 1 group
11	31,32	Target location, peripheral 1 group
12	33,34	Audience location, peripheral 1 group
13	36,37	Function, peripheral 1 group
14*		
15	41	Role structure, peripheral 1 group
16	46,47,48	Role allocation, peripheral 2 group

Field Code	Column on Card	Name of Field
17	49,50	Emitter location, peripheral 2 group
18	51,52	Target location, peripheral 2 group
19	53,53	Audience location, peripheral 2 group
20	56,57	Function, peripheral 2 group
21*		
22	61	Role structure, peripheral 2 group
23	65	Teacher role assignment
24	69,70	Teacher location

*These code numbers were assigned to no field.

It is also useful to examine the structures of these various fields. However, in doing so it is not necessary to describe each field in detail, since there is redundancy among some of the fields. For instance, each of the three role structure codes (07, 15, and 22) made use of the same code. Consequently, in Figure 4-17 below, only nine different types of code need be identified. (The codes themselves were, of course, defined explicitly in Chapter III.)

Figure 4-17. Dependent Variable Codes.

Field Codes	Name of Field	Codes
01, 09, 16	Role Allocation	Coded as a three-digit field where the first digit represents the position of the emitter in the group, the second the position of the target, third the position of the audience. The same code is used for all three digits. 0 = No role (no group)* 1 = Teacher 2 = One pupil 3 = A pupil segment 4 = The pupil quorum 5 = Teacher plus one pupil 6 = Teacher plus pupil segment 7 = Teacher plus pupil quorum

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*When "0" is coded for only one or two roles, the role involved did not exist. Where "000" is coded, no group existed. Role allocation was never unclear.

Field Codes	Name of Field	Codes
02, 10, 17	Emitter Location	Coded as a two-digit field where the first digit represents the vertical location in the classroom and the second digit the horizontal location. Vertical Location Codes 0 = No group 1 = Diffuse location 2 = Front 3 = Forward 4 = Middle 5 = Rear 6 = Back 9 = Not clear Horizontal Location Codes 0 = Group does not exist 1 = Diffuse location 2 = Right side 3 = Right 4 = Middle 5 = Left 6 = Left side 9 = Not clear
03, 11, 18	Target Location	Coded as is Emitter Location
04, 12, 19	Audience Location	Coded as is Emitter Location
05, 13, 20	Function	Coded as a two-digit field, the first digit representing content area and the second representing mode. Functional Mode Codes 0 = Group does not exist 1 = Experiention 2 = Information Dissemination 3 = Intellectualization 9 = Not determined Functional Content Area Codes 0 = Group does not exist 1 = Academically relevant subject matter 2 = Non-relevant subject matter 3 = Sociation 4 = Classroom management 9 = Not determined
07, 15, 22	Role Structure	Codes as a single digit field 0 = No roles (no group) 1 = Audience only 2 = Emitter plus audience 3 = Emitter plus target plus audience

Field Codes	Name of Field	Codes
		Codes as a single digit field. 4 = Emitter plus target 5 = Emitter only
08	Communication Structure	Coded as a two-digit field. 00 = No groups 01 = Central group only 02 = Peripheral 1 group only 03 = Peripheral 2 group only 04 = Non-involved persons only 05 = Central + per 1 + per 2 06 = Central + per 1 + non-involveds 07 = Central + Non-involveds 08 = Peripheral 1 + peripheral 2 09 = Peripheral 1 + non-involveds 10 = Peripheral 2 + non-involveds 11 = Central + per 1 + per 2 12 = Central + per 1 + NI 13 = Central + per 8 + NI 14 = Per 1 + 2 + NI 15 = Central + per 1 + per 2 + NI
23	Teacher role assignment	Coded as a single-digit field. 0 = Teacher non-involved or out of room 1 = Teacher emitter of central group 2 = Teacher target of central group 3 = Teacher audience in central group 4 = Teacher emitter of peripheral 1 5 = Teacher target of peripheral 1 6 = Teacher audience in peripheral 1 7 = Teacher emitter of peripheral 2 8 = Teacher target of peripheral 2 9 = Teacher audience in peripheral 2
24	Teacher location	Coded as is Emitter Location

The second step of the analysis was the entry of several recoded informations onto the episode card. Included were codes for communication structure, role structures for each of the communicating groups, teacher role assignment, and teacher positional location. In addition, the length of each episode in real time was calculated and entered by subtracting the index-time number on each card from that found on the card following it and multiplying by four.

Finally, each card had entered into it codes for the independent variables for which the sample of classrooms was selected (see below).

Various types of computer runs were then made from the data. Tabulations were prepared of the number of episodes and the length of time spent in various types of classroom activities (see Chapter V). Classrooms differing in terms of one or more independent variables were also compared with one another using t tests for proportions of: (a) numbers of incidents occurring within a given code category, and (b) time spent within the total class hour in a given code category (see Chapter VI). Coincidental effects among various types of classroom activity phenomena were also examined using Lambda, the index of predictive association (see Chapter VII). Finally, the simple, sequential effects of classroom activities upon one another were also examined. Details of each analysis are presented at the beginning of Chapters V through VIII. As this report is being written, we have retained the data in the computer and are continuing to work on the general problem of multi-faceted sequential analysis as represented by these classroom activity episodes.

Discussion

The weakest step in our data processing sequence is that of coding. In general, the coding procedures developed were both time consuming and in some cases of uncertain reliability. Would it be possible to improve the coding process?

This is a difficult question to answer without alternate procedures against which to evaluate those we have adopted in the study reported. For example, although it would certainly have speeded up coding had the coders been provided with a transcription of each class hour, it is uncertain whether the gain in coding time would have exceeded the additional cost of transcription. It would certainly have improved matters had we improved the systems for blanking audio noise and time indexing. Again some time was undoubtedly lost because coders were not provided with a seating chart of each classroom. They were therefore forced on occasion to locate pupils in terms of their subsequent actions. We also hope in the future to develop a mechanical system that is linked to the tape player so that transcripts and coding sheets may be rewound and advanced in time with the recorder. In such a manner the coder would not only be provided with a record that moved as did his basic data, but also his time spent in organizing and moving piles of paper would be reduced.

It is also reasonable to anticipate a comment that will be expanded in Chapter VIII. The complex type of sequential data represented by our classroom activity records is relatively new in the social sciences. Similar problems may be encountered in certain problems in industrial flow analysis or in computational linguistics. Our data are, in fact, a set of sequences of multi-dimensional vectors whose dimensions change through various patterns, often lasting through a numder of cards. Procedures are simply not available for the studying of this form of data at present, and when we criticize our own efforts in Chapter VIII, we are but hoping that better techniques may be developed in the future.

Classrooms Sampled

We turn now to the specific design of the study whose data are to be reported here.

The Approved Strategy

It is obvious that the recording of videotapes of classroom hours is an expensive business. Not only is there an initial cost of some $60.00 for each hour of videotape used, but schools and teachers must be contacted, classrooms set up for recording, and trained Research Assistants and Engineers hired for the purpose of making the videotape records. We would certainly have liked to analyze a wide variety of classroom recordings in this initial, pilot study. In the best of all possible research worlds it should have been possible to collect extensive data in a wide and representative variety of classroom settings, each setting to have had its particular modes of behavior thoroughly sampled over a protracted length of time.

However, time and funds were limited. Given these limitations, two approaches seemed possible. Either we might have made longitudinal studies of one or two classrooms, or a larger number of classrooms could be studied for shorter periods of time. The first of these strategies would have generated considerable insights about the classroom chosen (see, for example, L. M. Smith and Geoffrey, (1965). However, in the long run we felt it a better bet to study a larger number of classrooms since in so doing we could assess the strength of the classroom activity concepts proposed against a series of independent variables that presumably differentiated among sampled classrooms.

Once the above decision was made, our problem became one of selecting classrooms that were reasonably representative of classroom settings at large and which varied systematically on a number of relevant, independent variables. Funds dictated that we could study not more than fifty classrooms, and we felt that it would be unreasonable to sample each classroom for less than two class sessions. What independent variables might we then study?

Five independent variables were chosen:

1. Age of teacher (young (under 30) versus old (over 40)
2. Sex of teacher -- male versus female
3. Subject matter of the lesson -- mathematics (arithmetic) versus social studies
4. Grade level -- First versus sixth versus eleventh grades
5. Style of instruction -- Subject-centered versus pupil-centered (as rated by the teacher's principal).

These independent variables were chosen from a much larger initial list because of their near-universality in American education, their presumed influence on overt processes in the classroom, the ease with which they might be measured, and their non-controversial character. In actual fact, the fifth variable-style of instruction, truned out to be sterile. Principals gladly provided ratings of their teachers, but (as so often happens) the ratings did not appear to correlate with behavioral differences we could observe in the classrooms, and so we dropped this variable from the analysis of results.

The selection of classrooms was also constrained by a variety of other factors. In order to obtain a measure of regularity throughout the whole sample, the following conditions were met:

1. Any participating teacher must have had more than two years of teaching experience.
2. Only regular classroom groups were to be used. (No team teaching situation was to be included.)
3. No "special" classes were acceptable, and no tests or examination situation.
4. Teacher-trainees should not be participants in the classroom.
5. The pupils should not be representative of a single minority social group of any sort.
6. The pupils should not come from a single social class background.
7. Each class should have met for not less than six weeks.

These conditions were designed to ensure that teachers who participated would be teaching uninterrupted class groups with which they were thoroughly familiar. It was also intended that the pupil groups should not display features that distinguished them markedly from other groups.

When all these conditions were taken into account, it became apparent that the classrooms to be approached should be sampled from school districts that were large and diverse enough to allow for considerable selection among the available classroom settings. Consequently, in the late Spring of 1963 approaches were made to School

Superintendents in charge of four, predominatly middle-class school districts from suburban St. Louis County. An initial meeting was held at which the project was outlined, the equipment described, an assurance of good faith given, and a request for co-operation made. All of the Superintendents expressed interest and unhesitatingly offered assistance. Thereupon they conferred with their various school Principals and determined on a list of possible teacher collaborators. As a next step, each prospective participating school was visited, and meetings were held either collectively or separately with potential teacher collaborators. Two teachers, after deliberation, declined to participate. The remainder expressed willingness and even eagerness. Each teacher was reassured that the recordings would be used only for research purposes and that their personal anonymity would be safeguarded. Each teacher was also promised the opportunity to view his or her own tape and was also given the right to authorize or refuse authorization of subsequent screenings.

Despite the extensive precautions taken to make the sampling procedure as watertight as possible, certain difficulties emerged. It proved impossible to find male Grade I teachers anywhere in the State of Missouri, and male Grade VI teachers who were over 40 years of age were rare. Consequently, the sample was modified, and male Grade I teachers were replaced by female teachers while in two of the four "over 40" male categories female teachers were substituted. In addition, equipment difficulties and school schedules interfered with some of the recordings, and three additional classrooms were videotaped from equivalent, middle-class schools from Jefferson City, the state Capital.

Individual classrooms could be recorded for only a limited time period, of course. Whereas primary classrooms might have been recorded for an arbitrary period of time, we were concerned to "equate" primary and secondary recordings so that comparisons could be made between them. Consequently, we decided to record classroom lessons. Two subject matters that were taught at all three grade levels -- mathematics and social studies -- were chosen. In the case of primary classrooms we were normally able to record both a mathematics and a social studies lesson within a given day, and perforce the same pupils were involved in the two lesson examples. Most secondary teachers, however, were subject matter specialists, and so we simply recorded two examples of lessons taught with different groups of pupils.

When does the lesson begin and end? Is the period immediately prior to formal instruction when pupils are milling around part of the lesson; is the terminal period when pupils are picking up their books and filing out of the classroom? In making recordings of lessons we did, in fact, include these initial and terminal periods of time. When coding lessons however, we restricted coverage to that period of time between the first teacher move which announced the beginning of the lesson and that which terminated it. In fact, this was sometimes quite difficult to ascertain for those primary teachers who liked a smoothed or integrated transition between portions of the class day.

Disruption and Distortion

As indicated earlier, the approach to each classroom was made with a minimum of disruption to ongoing class activity. "Dummy" camera boxes were placed in each classroom for one or more days prior to the actual day on which we had scheduled recordings. Pupils were told at that time that their classrooms were to be videotaped for research purposes and that they would not know (nor did they know) exactly which classes were to be recorded. Cables, and all other potentially disruptive equipment were strung in the air or out the windows so as to minimize impairment of traffic flow. It was obviously both in our interests and those of the participating schools to avoid disruption if at all possible.

How successful were we? To what extent were the recordings obtained a non-distorted reflection of "typical" classroom events?

Again, no simple answer can be given to these questions. All participating teachers were interviewed informally about this. Some reported some feeling of tension at the beginning of the first recorded session but testified that it disappeared as they became involved in the lesson. The researchers noted that several teachers appeared to "dress up" for recording days, although no such effect was noted for pupils who -- it will be recalled -- did not know on which day recordings were to be made. Occasionally, pupils would give evidence of being aware of the recording cameras -- gazing at them speculatively or, at interval time, "performing" in front of them. However, the overall impression gained was that the cameras overtly distracted the pupils to hardly any extent at all.

Although it cannot be claimed that the equipment had "no effect," perhaps the most significant commentary that can be made on this question was furnished by the wide variety of behaviors by both pupils and teachers in the sampled classrooms. Although these were not "green" teachers, some of the teaching practices observed violated common educational prescriptions for good teaching, common sense, and even the law; while various pupils were observed to engage in obvious classroom deviancies that were unobservable to the teacher but were in plain sight to the cameras. Indeed, let us assume that teachers and pupils were motivated to "fake" classroom events. What would they have then done to "improve" the recordings? In one of the classrooms recorded there was almost continuous disruption. There were mild altercations among the pupils, the children were noisy, some physical property was destroyed and at times there was little or no activity that could charitably be termed "instruction." When interviewed, the teacher of this classroom volunteered that the pupils were somewhat better behaved than they normally were, and she attributed this "improvement" to the presence of the cameras!

The Sample Studied

Some of the classroom videotapes recorded were used primarily for code development and pretesting. When we were ready to test coded data for classroom activities against the four, useful independent variables obtaining within our sample, a partially balanced sub-sample of the classrooms actually recorded was selected. This sample is given in Figure 4-18 below.

Figure 4-18. Sampled classrooms studied.

Independent Variables for the Sample

Classroom Number	Sex of Teacher	Age of Teacher	Subject Matter	Grade Level
01*	Female	Young	Mathematics	1st Grade
02			Social Stud.	
03	Female	Young	Mathematics	1st Grade
04			Social Stud.	
05	Female	Old	Mathematics	1st Grade
06			Social Stud.	
07	Female	Old	Mathematics	1st Grade
08			Social Stud.	
09	Male	Young	Mathematics	6th Grade
10			Social Stud.	
11	Female	Young	Mathematics	6th Grade
12			Social Stud.	
13	Male	Old	Mathematics	6th Grade
14			Social Stud.	
15	Female	Old	Mathematics	6th Grade
16			Social Stud.	
17	Male	Young	Social Stud.	11th Grade
18			Social Stud.	
19	Male	Young	Social Stud.	11th Grade
20			Social Stud.	
21	Male	Old	Social Stud.	11th Grade
22			Social Stud.	
23	Female	Old	Social Stud.	11th Grade
24			Social Stud.	
25	Male	Young	Mathematics	11th Grade
26			Mathematics	
27	Female	Young	Mathematics	11th Grade
28			Mathematics	
29	Male	Old	Mathematics	11th Grade
30			Mathematics	
31	Male	Old	Mathematics	11th Grade
32			Mathematics	

*Two classes were taught by each teacher sampled. In the case of primary teachers, we sampled a mathematics and social studies class taught by the same teacher. Secondary teachers were generally "specialists" with regard to subject matter, and we sampled two examples of classes taught from the same subject field.

Various characteristics of this sample should be noted. (1) The sample is a factorial design and not a random sample of any universe of classrooms. (2) Although attempts were made to balance each independent variable against the others, there were twice as many 11th grade classrooms as 1st or 6th grade classrooms. (3) Only in the sixth grade were there an equal number of male and female teachers. Teachers at the first grade were entirely female while teachers at the 11th grade level favored males, six to two. This means that any comparison involving grade level is biased with sex-of-teacher results and vice versa -- except for those involving the 6th grade only. (4) However, other independent variable comparisons are unbiased in the design. These factors were reflected in the analysis strategy, particularly in those results reported in Chapter VI.

Discussion

In several ways the results from this particular study must be presumed limited and should not be automatically generalized to classroom events in general. In the first place, our results pertain to classroom lessons. Although it is reasonable to presume that most classroom activity at the secondary level is involved with subject matter lessons, at the primary level a variety of non-lesson classroom activities occur, such as home-room, milk money time, show and tell, and the like. These latter are not reflected in the data reported here.

Secondly, our results may be presumed to be limited to the independent variable conditions which determined the sample.

Thus, we have no recordings for second, third, or ninth or twelfth grade classrooms; no recordings of French or English lessons; and no recordings of teachers aged between 30 and 40. Whether or not our limited coverage generates materials that would apply to these other grade levels, subject matters, and teacher ages is a matter for speculation.

Thirdly, our results should also be assumed to be limited to the characteristics of the subject populations involved in sampled classrooms. Most of our pupils were white, middle-class Americans -- as were most (but not all) of their teachers. All were resident in Missouri. The schools in which classrooms were sampled were all reasonably affluent and enlightened in their educational policies. Most classrooms evidenced a richness of artifacts -- books, flowers, models, television sets -- and in several of the classrooms studied there was evidence of creativity on the part of the teacher in the arrangement of desks or the presentation of curricula. Teachers who participated were not in their first year of teaching, and it is likely that the really "weak" teachers in the schools studied were those who did not choose to cooperate with the study. Classrooms studied were in the "middle" of their semesters and were observed for not more than two lesson periods.

Still, in comparison with other, recent studies of classroom interaction, it should be noted that a wider variety of classrooms was investigated here than in any other study reported (see Chapter II). In interpreting the results of this pilot study the reader should bear in mind not the limitations of our sample but rather that this was indeed a pilot study. It has been our intention to develop codes for classroom activity and then to validate them against a limited set of independent variables. In the next step of our broad research program we hope to use these and related codes in studies of a wide variety of classrooms.

Summary

The purpose of this chapter has been to describe our methods of data collection and analysis, and to summarize the characteristics of the sample used in the pilot study reported.

Data for the study were first collected in the form of videotape recordings made within live classrooms. In order to collect these data we assembled a unique recording facility consisting of remotely controllable video cameras, microphones, a control console, cabling, a portable tape recorder, and a truck that is used both for transporting the equipment and as a control booth in field locations. Explicit procedures were also developed for using this equipment to make recordings of classrooms, and it was found necessary to operate the equipment with two, trained persons: a graduate assistant who was in charge of recordings and their content, and an electronic engineer who supervised the equipment. The system proved reasonably reliable and flexible in its operation, although the cost of videotape remains high, and it was felt that the problems of audio noise and of time-indexing the tape were not adequately solved in this pilot study.

Our techniques of data analysis began with the playing-back of videotapes through equipment designed explicitly for the purpose. Although we explored techniques for transcribing classroom interaction, we found that the coding of classroom activities could proceed without performing the intermediate step of transcription. Coding procedures required coders to enter numerical codes corresponding to activity states on a special coding sheet designed for the purpose. These codes were then transferred to IBM cards and entered into the computer for subsequent analysis. Coding reliability proved to be reasonably high, although it was found that reliability for functional codes and for the first grade were lower than other reliabilities.

A sample of nominally white, middle-class classrooms was approached that differed in a factorial design in terms of four, independent variables: age and sex of teacher, subject matter, (mathematics versus social studies) and grade level (first, sixth, and eleventh). Of a larger number of classrooms recorded, 32 classrooms were chosen for subsequent analysis in a design that was balanced for subject matter and age of teacher but was only partially balanced for teacher sex and subject matter.

CHAPTER V

GENERAL CHARACTERISTICS OF CLASSROOM ACTIVITIES

Four chapters in this report are concerned with the presentation of results. This first results chapter details findings for the entire sample of classrooms and profiles of activity data for the 32 classrooms individually. Chapter VI is concerned with the influence of the independent variables -- age and sex of the teacher, grade level, subject matter -- on classroom activities. Chapter VII deals with the coincidental relationships among activity components. Chapter VIII examines the simple, sequential properties of activity components.

Chapter V is intended to provide the reader with a general overview of classroom activity characteristics as they appeared in the lessons investigated. Our first concern is with the number and duration of activity episodes in each of the lessons studied. (It will be recalled that episodes as contrasted with incidents are defined as units of time during which there is no change in any activity.) Next we turn to a similar analysis for incidents defined in terms of each of the separate, dependent variable classes of the analysis. Incidents, which are usually longer than episodes, are units of time during which one specified kind of activity does not change, although any or all of the others might. Finally, displays of frequencies and durations of incidents for each variable class category and classroom are presented and discussed.

For the most part, data presented in this chapter are interpreted directly, and no unusual analytic methodology was used.

Figure 5-1. -- Activity Episodes in the Classroom

Lesson No.	Less Duration in Seconds	Raw Number of Episodes in Lessons	Mean Episode Duration	Correction Factor	Adjusted Number of Episodes in Lesson
1	1221	226	5.40	2.532	572
2	3566	738	4.84	.867	640
3	2183	298	7.33	1.416	422
4	1479	283	5.23	2.089	591
5	2998	543	5.52	1.031	560
6	2561	452	5.67	1.207	546
7	2331	291	8.04	1.326	386
8	2091	294	7.11	1.478	435
9	4458	588	7.58	.693	407
10	2434	176	13.83	1.270	224
11	2897	508	5.70	1.067	542
12	3680	654	5.63	.840	549
13	4524	526	8.60	.683	428
14	3819	527	7.25	.809	426
15	3534	408	8.66	.875	357
16	3015	474	6.36	1.025	486
17	3460	353	9.80	.893	315
18	3187	315	10.12	.970	306
19	3809	328	11.61	.812	266
20	3480	268	12.99	.888	238
21	2787	157	17.75	1.109	174
22	3498	278	12.58	.884	246
23	3299	314	10.51	.937	294
24	3511	394	8.91	.880	347
25	3524	455	7.75	.877	399
26	3452	458	7.54	.895	410
27	1710	127	13.46	1.808	230
28	3010	241	12.49	1.027	248
29	3406	277	12.30	.908	252
30	3465	309	11.21	.892	276
31	3014	298	10.11	1.026	306
32	3515	386	9.11	.879	339
Total	98,918	11,944			12,217
Raw Means	3091.2	373.2	8.283		
Adj. Means			8.096		381.8

Activity Episodes

Figure 5-1, presents a listing of the number of activity episodes coded for each classroom in the sample. As may be seen in the Figure, classrooms exhibited considerable variability in the number of episodes they contained. The number of episodes recorded ranged from 176 to 738 during the lesson. It is difficult to interpret this number directly, however, since the lessons themselves also differed in length. The shortest lesson studied in fact lasted only 1,221 seconds, or approximately twenty minutes. The longest lesson lasted 4,524 seconds, or slightly more than seventy-five minutes. In order to obtain comparability of number of activity episodes, it is necessary to "correct" the raw figures in accordance with a standard length of time. The average length of lesson provided the basis. For this sample the average lesson lasted 3,091.2 seconds. A correction factor may be obtained by dividing the mean classroom duration by the actual duration for each classroom. This correction factor is then multiplied by the raw number of episodes in each lesson to give an adjusted figure that may be compared from classroom to classroom. When this is done it becomes clear that the "average" lesson studied lasted for 3,091.2 seconds and had 381.8 episodes which lasted for a mean duration of 8.096 seconds.

A quick scanning of Figure 5-1 suggests that the adjusted episodes numbers are not randomly distributed in the Figure. This informal observation may be checked formally, and the results of that examination are presented in Figure 5-2. In the latter figure we have presented adjusted mean numbers of episodes and adjusted mean lengths

Figure 5-2. -- Adjusted Numbers and Lengths of Episodes

Indepentent Variables			Adjusted Mean Numbers of Episodes			Adjusted Mean Lengths of Episodes
Grade	First	N=8	519	NS	P<.001	5.956
	Sixth	N=8	427	P<.01		7.239
	Eleventh	N=16	290			10.659
Age of Teacher	Old	N=16	366	NS		8.446
	Young	N=16	397			7.786
Sex of Teacher[1]	Male	N=4	371	NS		8.332
	Female	N=4	484			6.387
Subject Matter	Math.	N=16	383	NS		8.071
	S.S.	N=16	380			8.135

[1] Sixth grade only.

of episodes for the major independent variable breaks of the sample. For example, first grades averaged 519 episodes (in a 'lesson' that was 3,091.2 seconds long), sixth grades 427 episodes, eleventh grades 290 episodes. Figures are also presented for age and sex of teacher (the latter for sixth grade only, since sex and grade number level are otherwise confounded) and for subject matter. Each of the adjusted means was also tested against the others that were comparable using a *t* test based on the assumption of independence of classrooms.

When this is done, we note a significant tendency for number of episodes to vary inversely with grade level. There is also a nearly significant tendency for classes with male teachers to have fewer episodes than classes with female teachers and a slight tendency for classes with older teachers to have fewer episodes than classes with younger teachers. Although these latter results are not significant here, we shall find that they fit well with significant findings from later chapters.

It would seem from Figures 5-1 and 5-2, that the classroom is a reasonably busy place. There is evidence of frequent and rapid structural or functional change in the activity structure. Even in the least active lesson, a change of one sort or another occurred on the average of once every eighteen seconds, while the most active classroom averaged a new activity episode approximately once every five seconds. Again, the teachers of our sample appeared to have considerable freedom to determine the duration of their lessons. While secondary lessons were more constrained by the clock, there was little evidence that the timetable coerced primary teachers into packing lessons into uniform sizes.

Figure 5-3. -- Activity Incidents.in the Classroom (Raw Frequencies)

Lesson Numbers

Variable Classes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	116	347	112	213	254	291	193	194	272	139	0	307	172	215	148	263	94
2	90	287	83	175	259	274	115	196	231	133	0	327	156	285	137	272	99
3	87	200	79	105	134	153	98	103	185	82	0	208	101	111	99	173	57
4	28	37	16	8	21	24	15	8	66	6	0	14	23	3	29	10	11
5	28	99	111	57	106	70	61	34	189	52	0	174	78	66	125	129	54
6*																	
7	93	279	86	124	172	235	152	169	205	117	0	153	144	163	134	182	81
8	103	286	102	51	139	93	74	56	212	10	147	240	284	181	179	114	122
9	43	124	42	28	43	25	23	26	63	5	204	108	100	84	55	42	45
10	45	109	41	20	47	16	23	23	55	0	278	90	100	79	56	44	48
11	44	116	40	19	42	15	21	23	56	0	169	92	94	75	55	44	46
12	12	13	11	7	16	6	10	10	16	0	108	37	26	33	16	16	18
13	40	109	31	18	38	14	22	23	46	0	109	86	90	74	60	39	41
14*																	
15	38	101	34	18	42	15	22	26	63	0	158	99	100	81	55	42	43
16	20	47	22	4	4	5	6	7	27	0	75	22	46	22	26	33	24
17	20	43	18	3	4	5	6	7	26	0	68	22	47	21	24	20	33
18	19	47	16	3	4	5	4	7	31	0	69	22	51	19	26	22	33
19	2	4	6	1	1	0	2	3	10	0	13	5	14	7	6	11	9
20	15	36	13	3	4	5	4	7	25	0	59	20	43	18	22	17	21
21*																	
22	16	41	21	4	4	5	5	7	27	0	73	21	45	22	26	23	23
23	90	305	65	127	128	228	119	157	0	116	190	209	131	188	126	192	66
24	92	250	81	68	233	80	[illegible]4	18	160	31	85	168	112	101	136	194	61

Figure 5-3, (continued)

Variable Classes	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	85	56	88	68	120	141	174	254	257	40	81	153	174	148	113
2	86	173	143	31	64	162	212	166	188	38	101	112	182	140	121
3	47	40	55	44	76	72	93	149	140	31	59	83	97	81	54
4	4	7	14	3	5	7	12	9	13	8	8	2	4	19	8
5	37	55	30	54	50	38	44	110	91	49	76	66	64	96	72
6*															
7	75	54	82	64	97	138	156	238	252	28	44	142	153	138	101
8	123	55	46	23	70	26	77	87	95	29	79	10	14	113	169
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	43	18	7	8	31	14	25	53	50	7	29	2	4	33	66
11	48	19	7	6	34	15	33	45	53	7	29	2	5	35	70
12	16	8	2	2	14	1	7	18	14	3	6		3	2	9
13	38	18	7	8	32	14	19	40	44	6	25	2	4	31	58
14*															
15	45	20	8	8	34	14	20	53	38	7	26	2	7	33	63
16	29	9	5	1	7	4	12	8	8	8	10	3	3	15	41
17	30	7	6	2	7	4	13	8	10	7	9	2	2	16	40
18	31	8	7	1	8	4	15	5	10	8	13	2	2	17	38
19	15	4	3	0	1	1	2	2	0	4	4	0	2	0	5
20	27	7	5	1	6	4	9	4	5	6	8	2	2	14	31
21*															
22	29	9	5	1	7	4	12	8	5	8	9	2	3	14	38
23	68	45	60	21	60	133	164	168	174	26	63	102	139	139	86
24	19	166	120	8	39	40	68	146	117	27	37	15	33	141	54

Activity Incidents

The concept of activity episode is only marginally interpretable at this level, however. What types of structural or functional changes were producing these high levels of activity-shift in the classroom. The answer to this problem is provided by considering activity incidents, and data parallel to those already presented for episodes are provided for incidents in Figures 5-3 and 5-4.

Figure 5-3 presents the raw frequencies of activity incidents for all 32 classrooms and each of the 21 dependent variable classes that was used for the generation of incidents. Let us take one or two examples from this figure. In Lesson 01 we discovered that there were 116 *distinct incidents in which there was a codable* shift in role allocation in the central group. In this same lesson, there were 261 communication structure incidents, and the teacher took on 223 codably distinct, role assignment conditions sequentially.

Clearly the data from Figure 5-3 are comparable with those from column two of Figure 5-1; that is, the entries in Figure 5-3 are raw frequencies which may not be compared across lessons until we have adjusted their values for the actual length of the classroom. An adjustment similar to that made for Figure 5-1 was made for the data in Figure 5-3, and the results may be found in Figure 5-4. Entries in this latter table are "adjusted" frequencies for classroom incidents which may be compared among classrooms which are presumed to have a standard length of 3,091.2 seconds. Data from Figure 5-4 may be compared with column five from Figure 5-1.

It is first useful to look at the adjusted mean numbers of incidents and adjusted mean incident durations appearing at the right-hand side of Figure 5-4. It will be recalled that incidents must come at a pace that is not more rapid than episodes. Consequently, it is no surprise to discover that the most rapidly shifting incident field, Role Allocation in the Central Group, averages 174.3 incidents in the standard lesson, or approximately one incident every 17.7 seconds. (The equivalent figures for episodes from Figure 5-1 were 381.8 episodes in the standard lesson and one episode every 8.1 seconds.) Many of the incident fields were much slower paced, however. For example, Audience Location in the Second Peripheral Group averaged only 4.2 incidents in the standard lesson, or one incident every 736.0 seconds.

It is still true for activity incidents that the classroom is a busy place, however, particularly for those dependent variables associated with the central group. The standard lesson averaged 106.3 Communication Structure incidents, 174.3 Role Allocation, 161.5 Emitter Location, 102.1 Target Location, 14.9 Audience Location, and 75.2 Functional incidents for the Central Group. In addition, 135.5 incidental shifts occurred for Teacher Role Assignment and 95.7 for Teacher Location during the standard lesson. These rates indicate considerable shift in communication structure, in location, and in function during the typical class hour and reinforce the conclusion that the classroom is a busy place in many ways. (Although we note in passing that incidents involving the first peripheral group occurred with only about a

Figure 5-4. -- Activity Incidents in the Classroom (Adjusted Frequencies)

		Variable Classes	1	2	3	4	5	6	7	8	9	10	11	12
Central Group Codes	1	Role Allocation	294	301	159	(445)	262	351	256	287	188	177	0	258
	2	Emitter Location	228	249	118	(366)	267	331	152	290	160	169	0	275
	3	Target Location	(220)	173	112	219	138	185	130	152	128	104	0	175
	4	Audience Location	(71)	32	23	17	22	29	20	12	46	8	0	12
	5	Function	71	86	(157)	119	109	84	81	50	131	66	0	146
	7	Role Structure	235	242	122	259	177	(284)	202	250	142	149	0	129
	8	Communication Structure	(261)	248	144	107	143	112	98	83	147	13	157	202
Peripheral₁ Group Codes	9	Role Allocation	(109)	108	58	38	44	18	30	38	44	0	303	91
	10	Emitter Location	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	76
	11	Target Location	(111)	101	57	40	43	18	28	34	39	0	180	77
	12	Audience Location	30	11	16	15	16	7	13	15	11	0	115	(31)
	13	Function	(101)	95	44	38	39	17	29	34	32	0	116	72
	15	Role Structure	(96)	88	48	38	43	18	29	38	44	0	169	83
Peripheral₂ Group Codes	16	Role Allocation	(51)	41	31	8	4	6	8	10	19	0	80	18
	17	Emitter Location	(51)	37	25	6	4	6	8	10	18	0	73	18
	18	Target Location	(48)	41	23	6	4	6	5	10	21	0	74	18
	19	Audience Location	5	3	8	2	1	0	3	4	7	0	14	4
	20	Function	(38)	31	18	6	4	6	5	10	17	0	63	17
	22	Role Structure	(41)	36	30	8	4	6	7	10	19	0	78	18
Teacher Codes	23	Role Assignment	228	264	92	265	132	(275)	158	232	203	147	203	176
	24	Location	233	217	115	142	(240)	97	125	27	111	39	91	141

Figure 5-4. (Continued)

		Variable Classes	13	14	15	16	17	18	19	20	21	22	23	24
1	Central Group Codes	Role Allocation	117	174	130	270	84	82	45	78	75	106	132	133
2		Emitter Location	107	166	120	279	88	83	140	127	34	57	152	187
3		Target Location	69	90	87	177	51	46	32	49	49	67	67	82
4		Audience Location	16	2	25	10	10	4	6	12	3	4	7	11
5		Function	53	53	109	132	49	36	45	27	60	44	36	39
7		Role Structure	98	132	117	187	72	73	44	73	71	86	129	137
8		Communication Structure	194	146	157	117	109	119	45	41	26	62	24	68
9	Peripheral 1 Group Codes	Role Allocation	68	68	49	43	38	46	17	7	9	35	13	29
10		Emitter Location	68	64	49	45	43	42	15	6	9	27	13	22
11		Target Location	64	61	48	45	41	47	15	6	7	30	14	29
12		Audience Location	18	27	16	16	16	16	6	2	2	12	1	6
13		Function	61	60	52	40	37	37	15	6	9	28	13	17
15		Role Structure	68	66	48	43	38	44	16	7	9	30	13	18
16	Peripheral Group Codes	Role Allocation	31	18	23	34	21	28	7	4	1	6	4	11
17		Emitter Location	32	17	21	20	29	29	6	5	2	6	4	12
18		Target Location	35	15	23	23	29	30	6	6	1	7	4	13
19		Audience Location	10	6	5	11	8	(15)	3	3	0	1	1	2
20		Function	29	15	19	17	19	26	6	4	1	5	4	8
22		Role Structure	31	18	23	24	21	28	7	4	1	6	4	11
23	Teacher Codes	Role Assignment	89	152	110	197	59	66	37	53	23	54	125	144
24		Location	76	82	119	199	54	18	135	107	2	34	37	60

Figure 5-4. (Continued)

		Variable Classes	25	26	27	28	29	30	31	32	Total	Adjusted Mean No. of Incidents	Adjusted Mean Incident Duration
1	Central Group Codes	Role Allocation	223	230	72	83	139	155	152	99	5577	174.3	17.7
2		Emitter Location	146	168	69	104	102	162	144	113	5153	161.5	19.1
3		Target Location	131	125	56	61	75	87	83	47	3267	102.1	30.3
4		Audience Location	8	12	14	8	2	4	19	7	476	14.9	207.5
5		Function	96	81	89	78	60	57	98	63	2405	75.2	41.1
7		Role Structure	209	226	51	45	129	136	142	89	4437	138.7	22.3
8		Communication Structure	76	85	52	81	9	12	116	149	3403	106.3	29.1
9	Peripheral₁ Group Codes	Role Allocation	53	40	14	28	2	6	34	62	1542	48.2	64.1
10		Emitter Location	46	45	13	30	2	4	34	58	1486	46.4	66.6
11		Target Location	39	47	13	30	2	4	36	62	1368	42.8	72.2
12		Audience Location	16	13	5	6	0	3	2	8	471	14.7	210.3
13		Function	35	39	11	26	2	4	32	51	1122	35.1	88.1
15		Role Structure	46	34	13	27	2	6	34	55	1311	41.0	75.4
16	Peripheral₂ Group Codes	Role Allocation	7	7	14	10	3	3	15	36	559	17.5	176.0
17		Emitter Location	7	9	13	9	2	2	16	35	532	16.6	186.2
18		Target Location	4	9	14	13	2	2	17	33	542	16.9	182.9
19		Audience Location	2	0	7	4	0	2	0	4	135	4.2	736.0
20		Function	4	4	11	8	2	2	14	27	440	13.8	224.0
22		Role Structure	7	4	14	9	2	3	14	33	521	16.3	189.6
23	Teacher Codes	Role Assignment	147	156	47	65	93	124	143	76	4335	135.5	22.9
24		Location	128	105	49	38	14	29	145	47	3063	95.7	32.3

third of the frequency of incidents involving the central group, while the second peripheral group appeared with only about one-tenth of the central group frequencies.)

However, it should also be pointed out that these averages for incident frequency tend to mask an enormous between-lesson variability in patterns of incident occurrence. Although the 32 sampled classrooms were relatively homogeneous with regard to episode frequency, the same statement cannot be made for incidents. In Figure 5-4 we have circled the greatest adjusted-frequency and underlined the least adjusted-frequency, for each dependent variable field. Generally, it will be seen that the classroom with the greatest incident frequency has roughly ten times the incident frequency of the least active classroom. For example, in Role Allocation for the Central Group, the most active classroom tallied 445 adjusted incidents while the least active classroom produced only 45 adjusted incidents. (In noting these figures we have ignored Classrooms 10 and 11. Classroom 10 evidenced no peripheral groups whatsoever, while in Classroom 11 there was no central group!) Although all of the lessons studied tended to be active, this activity was evidenced in a variety of guises.

It would be possible, also, to construct an additional table for incident data similar to that prepared for episode data in which the adjusted frequencies of incident occurrence were compared for various independent variable classes. In fact, such a table was actually prepared. However, it showed results that were generally similar to those of Figure 5-2,[1] except that none of the reported differences was significant because of the large between-class variability in incident occurrence. Consequently, the table is not presented here.

Category Frequencies and Durations

Figures 5-1 through 5-4 provide only "rate" information. Granted that classroom activities change, what is the content of that change? What is the typical form of classroom activity, and how are coded characteristics of classroom activities distributed among the 32 sampled lessons?

Questions of these sorts can only be answered by a detailed presentation of data for each dependent variable class. Figures 5-5 through 5-29 have been drawn up to place these basic data on record. These tables are organized in pairs, the first table presenting information on number of incidents by coding category, the second concerning itself with the total duration, in seconds, of incidents for that category. In all, ten variable classes are covered in these tables. (Presentation is limited to structural variables for the central group and functional codes for the central and peripheral groups because of inadequate frequencies for the other variable classes.) Data are presented in Figures 5-5 through 5-29 in raw form.

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[1] There was an inverse relationship between incident frequency and grade level, younger teachers scored slightly higher than older teachers on Teacher Role Assignment and Teacher Location incidents, and female teachers produced slightly more incidents than male teachers.

Communication System Structure (Figures 5-5 and 5-6.)

Two structures clearly predominated in the classrooms sampled, Central Group Only (01) and Central group plus one peripheral group (05). It is noteworthy that the codes which included a Central group (01, 05, 06, 07, 11, 12, 13, 15) accounted for roughly 70 percent of the total number of incidents, while codes involving peripheral 1 (02, 05, 08, 09, 11, 12, 14, 15) occurred in 50 percent of the incidents, peripheral 2 (03, 06, 08, 10, 11, 13, 14, 15) occurred in only 23 percent of the incidents, while non-involved persons (04, 07, 09, 10, 12, 13, 14, 15) were found in 49 percent of the cases.

The dominance of the central group becomes even more apparent when the duration figures are scrutinized. Central groups were in existence of 86 percent of the total time, peripheral 1 for but 18 percent, peripheral 2 for 8 percent, and non-involved persons for 26 percent. As in Figure 5-4, we conclude that incidents in which central groups are involved are, on the whole, longer than those involving peripheral groups or non-involved persons.

The fact that non-involved actors were recognizable for substantial portions of the lesson hour could imply that quite a substantial proportion of classroom activities were not being attended to. However, it should also be kept in mind that such residual groups varied in size and duration. Sometimes only one pupil might be non-involved. Sometimes the non-involvement might be quite transitory. Consequently, were inattention to be measured on a per capita basis it would be found to be considerably less than the gross figures recorded here.

Figure 5-5. -- Communication Structure: Frequency of Incidents x Lesson

Code Categories

Lesson	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	0
1	27	1		10	18	6	2		11	9	4	1		13	1	1
2	28			25	16	15	3		26	15	12	9		23	3	1
3	28			9	26	5	1		12	9	10			8		
4	20			6	10	2	3		3		1					
5	30			15	9		40		14		1	15	3	2	1	1
6	26			3	2		34		7		1	9	4	1	4	
7	29			10	21	2	3		3		2	2				
8	24				23	3					6					
9	45			25	32	10	32		11		13	23	3	2	10	
10	5			3			2									
11		8		3				4	64	3				61		1
12	91	1		4	77	6	22		8	2	14	9		6		1
13	1			45			52		50	10		45	10	20	30	
14	2						72		1			77	10	1	18	
15	46	3		33	27	10		2	30	10	3			13		
16	33			9	31	8	1	1	8	3	11	1	1	3	2	
17	35			6	33	9	2	1	6	4	11	2		11	2	
18	34	2			42	18					27					
19	13			4	13	1		1	6	2	5	1	1	7	1	
20	8			11	5		10				1	4	1		6	
21	11			2	8	1					1					
22	28			5	25				6		1			5		
23	17			8	11	2			3	1	3			1		
24	13	2		10	3	1	15	1	10	2	1	8	1	7	3	
25	20	3		18	9		4	1	14	6		4		8		
26	26		3	24	17	1	1	6	14	1				2		
27	7			3	3	1	1		5		2			5		
28	27			5	25	2	3		7	1	4	1		3	1	
29	3			1	1	1			1	1	1			1		
30	5	3		1	3			2								
31	36	1		16	20	8	1		11	6	4			10		
32	53	1	1	5	45	22	3	7	4	3	21			9		

Figure 5-6. - Communication Structure: Duration of Incidents x Lesson

Code Categories

Lesson	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	0
1	632	3		114	120	39	12		90	43	19	4		134	5	2
2	1674			159	476	127	413		165	99	59	101	7	244	38	1
3	1471			45	209	25	1		116	29	72			210		3
4	1248			31	83	11	49		35		6			14		2
5	933			121	70		1690		161		7	79	6	11	3	12
6	1411			49	18		935		66		3	46	14	5	12	
7	1925			91	203	22	15		45		8					
8	1917				134	11					28	20				
9	2548			327	239	43	749		73		205	158	24	10	78	
10	2387			26			21									
11		45		38					1781	20				986		2
12	2655	20		19	553	22	177	23	41	8	70	30		76		3
13	1			1044			1341		701	86		742	96	203	303	
14	8						2725		7			861	64	4	149	
15	1746	12		858	225	70		21	336	80	47					
16	2301			66	301	79	15	2	53	50	69	2	4	135	22	
17	2625			55	340	48	15	50	42	13	109	29		95	36	
18	2416	4			338	106					321					
19	3514			23	72	12		36	45	17	11	3	5	32	37	
20	2506			723	42		97				2	18	4		88	
21	2653			24	99	6					4					
22	3080			27	208				88		2			93		
23	3121			58	47	6			39	1	17			9		
24	2754	9		104	5	2	289	3	75	8	6	69	2	168	15	
25	2583	50		349	84		180	9	155	33		37		59		
26	2419		20	582	131	6	2	159	103	19				9		
27	1544			42	31	3	6		45		7	1		30		
28	2430			37	328	3	24		45	6	87	1		45	3	
29	3339			1	6	1			11	19	18			10		
30	3310	36		24	24			56								14
31	2430	12		179	145	36	12		61	25	44			69		
32	2230	11	3	62	309	146	26	29	72	17	240			368		

Figure 5-7. -- Teacher Role Assignment: Frequency of Incidents x Lesson

Code Categories

Lesson	01	02	03	04	05	06	07	08	09	0
1	40	28	5	13	4					22
2	130	99	50	6	20					45
3	33	21	1	9	1					14
4	61	58	3	3	2					6
5	66	41	10	7	4					17
6	117	102	8	1						6
7	59	41	17		2					10
8	78	70		1						
9	94	86								23
10	58	51	7							3
11				96	82	12				8
12	95	77	30	3	4					13
13	65	48	3	4	1					24
14	79	75	15	13	3	3				3
15	59	49	3	12	3					37
16	96	38	51	6	1					22
17	34	31								10
18	34	34								2
19	24	20	1							6
20	35	25								11
21	12	8	1							2
22	23	22	20	2	2	1				7
23	69	63	1							7
24	83	75		4	2					14
25	72	63	1	12	15	3	1	1		21
26	79	74		14	7					29
27	13	12	1							5
28	31	31								11
29	52	50								1
30	70	69								3
31	62	11	61	1	4					23
32	43	38		2	3					11

Teacher Role Assignment (Figures 5-7 and 5-8)

Figures 5-7 and 5-8 reveal the extent to which the teacher dominates the classroom scene. Teachers were emitters in 46.3 percent of all incidents recorded, and targets in 37.5 percent. They adopted an audiential role for but 6.9 percent of the total number of incidents and, interestingly enough were non-involved more often -- for 9.3 percent of incidents. In terms of time involved, teachers were emitters for 58.5 percent of the time, targets for 24.7 percent, audience members for 7.2 percent, and non-involved for 9.6 percent. It is evident from these figures that teachers do not readily accept the role of interested onlooker. They either take an active part or else they tend to withdraw from the situation.

In gross terms, it is also true that most of the teacher's effort is spent on the central group. In 82.0 percent of incidents teachers were to be found in the central group, as opposed to 8.7 percent in peripheral group one and 0.0 percent in peripheral group two. In terms of time involved, the figures were 84.9, 5.5, and again 0.0 percent of the time involved. Much of the teacher's effort appears to be centralized, although it should be pointed out that in lesson 11, where there were only peripheral groups, the teacher spent *all* of her time in the first peripheral group.

Figure 5-8. -- Teacher Role Assignment: Duration of Incidents x Lesson

Code Categories

Lesson	01	02	03	04	05	06	07	08	09	0
1	614	138	71	117	69					210
2	1613	724	505	58	163					500
3	1493	286	2	165	5					230
4	847	546	3	15	22					43
5	2242	469	73	70	62					180
6	1717	650	72	5						116
7	1630	373	179		12					136
8	1160	928		1						
9	566	449								168
10	995	888	322							26
11				1814	991	30				62
12	1665	756	1055	5	67					138
13	1675	802	11	121	5					1908
14	1202	1404	1077	73	11	9				42
15	1254	787	45	309	20					1117
16	1626	334	682	52						313
17	2602	602		50						206
18	2150	1031								5
19	3051	323	281							154
20	2021	735								723
21	1535	1196	32							24
22	1784	1136	144	79	51	1				101
23	2276	415	500							107
24	2602	513		79	15					301
25	1995	830	58	102	138	12	3	2		399
26	1825	733		133	80					678
27	1087	498	5							118
28	1307	1537								164
29	2255	1110								41
30	2251	100								131
31	941	198	1506	12	63					292
32	1978	975		32	96					432

Teacher Location (Figures 5-9 and 5-10)

The mechanistic nature of the system used for plotting locations precludes an interpretation of the data in "task" terms. For instance, although locations 23, 24, and 25 represent the "center-front" part of the room, it does not necessarily follow that the teacher's table or, for that matter, a blackboard, was located there. Similarly, it does not follow that a teacher who characteristically occupied a non-front location therefore had her table placed at the location occupied most. However, certain general points can be made. The teachers were more often in that part of the room regarded as the front than elsewhere (39 percent of incidents). Nonetheless they were in other locations frequently (37 percent of incidents) and did engage in walking about the room to some extent (24 percent of incidents).

The duration figures heighten the impression that teachers' spiritual home was at the front of the room. Locations 21, 22, 23, 24, 25, 26 were occupied for 68 percent of the total time. For 15 percent of the time they were in other locations, while the proportion of time spent walking about the room accounted for the remaining 17 percent of the total time.

It would seem as if there is a location occupation principle operating in classrooms. It might be expressed thus: the further a location is from the middle front of the room the less likely it is to be visited by the teacher. If teacher-pupil contacts are educationally desirable, it would seem then that fringe dwellers in the classroom are, in this respect, underprivileged.

Figure 5-9. -- Teacher Location: Frequency of Incidents x Lesson

Code Categories

Lesson	11	20	21	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46	52	53	54	55	56	63	64	65	66	0
1	27					7	10			3	9	7			2	11	5				7	4						2
2	100			2	4	75	10	1	1	8	11	1	2		1	6	5	9			5	7	2					6
3	14				1	21	6	1			14	1	3		2	8					2				2	4	2	2
4	25				1	21	12	1			3					5												
5	32		1	2	11	43	5	1	4	7	47	3	6	2	6	38	2	4			12	1	2		4			5
6	22			1	4	31	3	2	1	2	4	2	2		2	2	1	1										
7	28					36	4				15					8					2				1			1
8	2					6	1			1	3					2					2				1			
9	22				33	40	7		7	11	15	6		4	4	7	1			1	1							
10	9					4	3					2					13											1
11	19					18		1		4	30					4				3	5				1			3
12	40					27	18	3		2	21	1	5		2	11		2		2	25	4	2	1	1			4
13	27					31	3	3	11	2	4		3	9		2		3	10		2		1		1			1
14	12			2	3	16	6		10	4	2		2	12	8	2		2	14	2			1	2	1			2
15	36					38	8		2	2	18	1	6		1	3	2	2		1	2	2	2		1	7		7
16	59				1	52	18		1	1	9	1	23	1		6		12			2		2		2	2	1	14
17	10				14	30	3				3	1																
18					2	9	4	2			1		1															
19	7				6	64	66		1		2	3	12		1	4												4
20	11				9	36	26		4	3	8		4	1	3	5		1	1	2	4	1	1					4
21	3					4																						
22	15					20	1										2											1
23	7		1			9		1			7					7					4	1	1		1			3
24	12				1	16	1			1	11	3			3	6	2			1	7	3			1			1
25	19		1			52	10	4		3	5		20		3	13	3	1			2	6			1	1		8
26	25				1	30	14		1	2	8	2	18			2		8			2		3		1			6
27	6				4	13	2	1								1												
28	9					17	3	2			2	1	2								1							2
29	1				2	7			1		2					1					1							1
30				1	3	12	2	3					5			3												3
31	66					10					1	2	2			1					20							8
32	10				11	26	4				1	1	1		1													2

Figure 5-10. -- Teacher Location: Duration of Incidents x Lesson Code Categories

Lesson	11	20	21	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46	52	53	54	55	56	63	64	65	66	0
1	305					161	201			30	91	44			13	101	79				56	51						5
2	1108			5	42	1680	67	19	2	55	156	5	32		8	82	112	45			58	38	9					40
3	224				3	1299	36	27			240	16	24		60	110					17				12	68	13	31
4	145				6	972	282	1			12					59												
5	265		13	6	157	1110	15	1	12	81	559	24	40	17	43	451	25	62			78	1	14		30			77
6	207			2	20	2244	14	6	6	3	21	9	5		6	11	4	2										
7	315					1730	41				114					75					21				16			18
8	9					2023	22			21	6					5					3				1			
9	414				616	1520	142		940	107	343	112		82	41	93	11			15	4							11
10	549					98	129					9					164 8											
11	87					727		2		521	1293					60				18	40				8			9
12	1186					781	541	24		7	391	33	21		4	187		5		11	344	35	73	8	1			22
13	1930					2042	6	15	76	8	43		6	48		23		72	118		33		44		46			1
14	1110			3	14	343	43		63	14	12		42	342	140 8	62		6	188	4			41	4	11			18
15	1099					1610	54		46	26	203	2	43		3	13	11	22		11	40	53	6		5	210		62
16	893				2	891	105		6	4	59	11	414	6		43		240			78		10		33	4	11	103
17	206				195	2954	24				60	19																
18					34	3034	29	47			5		21															16
19	416				54	2467	545		9		4	23	183		3	40												54
20	723				50	1930	433		16	129	56		49	1	14	25		2	2	7	24	7	1					
21	56					2729																						
22	205	49				3122	1										64											57
23	606		5			2558		2			21	4				34					45	14	2		2			3
24	140				2	2961	1			2	52	35			18	51	11			8	84	12			3			128
25	433		2			2127	26	40		12	140		458		17	66	46	23			6	63			2	1		57
26	634				1	1827	102		4	34	102	4	469			11		115			11		90		3			43
27	123				36	1302	148	12								8												
28	134					2641	47	17			27	20	75								17							21
29	41				16	3278			2		29					2					24							14
30				8	30	3173	3	6					8			59		23										131
31	1729					237					4	2	3			3					928							106
32	422				198	2745	12				4	4			12													8

Role Allocation Central (Figures 5-11 and 5-12).

Not surprisingly, the three dominant role patterns were: (a) Teacher Emitter with a quorum Audience (104) -- 35 percent of incidents and 43 percent of duration, (b) single student Emitter, teacher Target and a quorum Audience (214) -- 22 percent of incidents and 26 percent of duration, and (c) Teacher Emitter, single student Target and quorum Audience (124) -- 17 percent of incidents and 16 percent of duration. Nonetheless, with the Central group quite a variety of different role allocations emerged. At some stage or other, _all_ possible variations on the Emitter theme were played, all but three of the Target possibilities were used, and only one kind of Audience (Teacher plus single student) was not recorded. Although distribution among the roles was far from equitable -- in that teacher predominated as Emitters and the Audience usually consisted of a quorum -- it must be conceded there were opportunities for almost a complete interchange of roles among the classroom personnel at some stage or other.

Figure 5-11. -- Role Allocation (Central): Frequency of Incidents x Lesson

Lesson	Code Categories[a]																						
	101	103	104	107	113	114	120	122	123	124	130	133	134	140	143	203	204	207	210	212	213	214	217
1			45						2	17			2	5			1	2			2	19	
2			100			1			3	61	1		3	1			7	48	1		1	80	
3			42			1	1		3	29	1	1	4								2	19	
4			74						1	34			3				1				2	35	
5		50	67						19	38		7	1					8	1		18	15	
6		2	117				2		3	39		1	1					6			1	44	
7	1		67				1		13	39	1	2	1	1	1	2	1	16	1		5	28	1
8			79							19		1		3		1					1	64	
9		5	80				12	3	17	31		8	6						16	10	19	61	
10			53	1	2				1	21			1					6				50	
11																							
12			63	1					1	58		2	2				2	15				62	
13		69							41			3						1			38		
14		32	51						9	6		2							1		25	34	
15		1	64						1	28			1				1	2				48	
16			59							72		1	4				3	39			1	35	1

Figure 5-11. (continued)

Lesson	101	103	104	107	113	114	120	122	123	124	130	133	136	140	143	203	204	207	210	212	213	214	217
17			38		1					20												25	
18			37							8											1	35	
19			27						1	5									1	1	1	19	
20			38				4	1		11									5	3	3	22	
21			31							28								1				8	
22			45							36			2				1	7				23	
23			69						2	6								1			1	61	
24	1	5	79				1		5	8											3	70	
25		1	122						1	66											1	62	
26			127							52					1							70	
27			11				2			9	1								2	1	3	9	
28			19						1	15									2		1	24	
29			72						1	29										1		50	
30			77					1		27												69	
31			13							57	1						1	58			1	10	
32			53							12			1								1	29	

Figure 5-11. (continued)

Lesson	224	226	227	241	253	254	304	306	307	313	314	324	326	327	353	410	413	504	603	604	700	703	0
1										3	9						1				4		11
2			6			5				2	10			1		7	1				5		27
3			1																				15
4			2							5	27						2	5	3	11		6	5
5	1							2		9	1					1			12	1	1	1	16
6								1		45	7					10	4		5			2	7
7										5	1		1		3			1	1				10
8										24													
9										2							1						23
10										2	1												3
11																							1
12	2	1	33	2					2	8	28		4	10					1				10
13		2								18													21
14										27	1												55
15			1								1												26
16	15		31							1													10

Figure [illegible]-11. (continued)

Lesson	224	226	227	241	253	254	304	306	307	313	314	324	328	327	353	410	413	504	603	604	700	703	0
17										[illegible]	3												12
18					1						1	1											1
19																							7
20											1												12
21																							2
22			4								2												5
23																							7
24										2													11
25																							12
26											6												14
27											1			1									5
28							1			1	14	3											7
29																							1
30																							3
31	2		3																				21
32											17												9

Figure 5-12. -- Role Allocation: Duration of Incidents x Lesson

Code Categories

Lesson	101	103	104	107	110	113	114	120	122	123	124	130	133	134	140	143	203	204	207	210	212	213	214	217
1			423							11	96			7	13			9	29			10	91	
2			810				19			69	589	2	1	9	2			49	480	2		5	626	
3			653				13	4		15	795			12								42	243	
4			438							1	297			9				1				29	437	
5		676	848							228	343		41	11					62	5		192	232	
6		11	1288					5		21	359		7	2					67			41	442	
7	6		1063					18		76	377	8	10	11	7	39	11	1	178	22		93	332	
8			1019								118		2		20		1					5	849	
9		30	1074					164	54	405	539		35	24						212	148	269	1077	
10			584	90		21				18	275			7					519				882	
11																								
12			837	4						2	781		6	15				37	394				600	
13		994								676			9						6			606		
14		500	570							34	88		10							21		487	663	
15		10	842							32	362			8				1	37				786	
16			657								936		8	39				21	278			28	292	10

Figure 5-12. (continued)

Lesson	234	226	227	241	253	254	304	306	307	313	314	324	326	327	353	410	413	504	603	604	700	703	0
1				42						9	27						1				64		387
2			19			18				10	41			2		23	1				112		669
3			2																				400
4			3							13	65						3	15	20	42		22	80
5	5							11		33	2					3			81	2	4	7	307
6								2		126	13					18	11		11			11	121
7										12	1		1		9			11	4				136
8										65													
9										5							7						410
10										4	3												26
11																							2897
12	4	2	578	4					6	66	101		17	54					4				168
13		5								190													2034
14										231	2												1212
15			8								2												1445
16	112		403							3													221

Figure 5-12. (continued)

Lesson	101	103	104	107	110	113	114	120	132	123	124	130	133	134	140	143	203	204	207	210	212	213	214	217
17			2387		22	9					184												403	
18			2060								89											80	876	
19			2958							5	87									10	33	3	977	
20			1860					60	1		100									67	87	30	546	
21			757								778								32				1196	
22			1254								520			9				25	126				1330	
23			2199							5	70								500			4	412	
24	1	43	2384					36		40	92											59	483	
25		2	1063							3	526											3	827	
26			991								825					4							712	
27			622					8			453	4								35	5	60	397	
28			554							22	730									49		72	1944	
29			1614							4	635										33		1077	
30			1834						30		387												1081	
31			180								754	7						12	1414			39	160	
32			1769								198			10								28	836	

Figure 5-12. (continued)

Lesson	224	225	227	241	253	254	304	305	307	313	314	324	326	327	353	410	413	504	603	604	700	703	0
17										60	137												256
18					76						1	2											3
19																							154
20																							723
21											4												24
22			18																				208
23											7												107
24										2													363
25																							656
26											19												892
27											1			5									118
28							14			8	64	10											133
29																							41
30																							131
31	9		87																				345
32											111												561

Role Structure Central (Figures 5-13 and 5-14).

The role structure data provide additional information on Emitter, Target, and Audience characteristics.

Not surprisingly, the three role structure (Emitter, Target, and Audience) and the two role structure which preserves teacher dominance (Emitter and Audience) account for the vast majority of incidents (94 percent) and the greatest proportion of the utilized time (97 percent). The evidence again emphasizes the public nature of classroom transactions. The intimate exchange between few persons, whether approved or not, did not feature to any marked extent among the classes of the sample.

On the other hand, the fact that other role structures occurred at all deserves some discussion. One role systems occurred infrequently, but when they did occur they tended to have considerable duration. This is particularly noteworthy for the Audience only system (1) which dominates Lesson 14. The system of Emitter only (5) can occur only when all persons in the group are chanting or singing simultaneously, and predictably such incidents occurred only at the 1st grade level. The appearance of a sizeable number of incidents in which no central group occurred (0) indicates that (particularly at the beginning and ending of the lesson) there were times when no central focus of classroom activities occurred.

Figure 5-13. -- Role Structure (Central): Frequency of Incidents
[illegible] Lesson

Code Categories

Lesson	1	2	3	4	5	0
1	0	45	39	5	4	
2		136	128	10	5	27
3		42	43	1		15
4		63	61			5
5		92	77	2	1	16
6		116	107	12		7
7		73	75	4		10
8		80	84	5		
9		84	94	27		23
10		60	57			3
11						1
12		77	76			10
13		70	74			22
14	3	81	78	1		1
15		66	18			26
16		92	90			10
17		38	42	1		10
18		37	38			1
19	1	27	25	1		6
20		38	35	9		11
21		32	32			2
22		52	47			5
23		70	68			7
24		80	75	1		11
25	1	122	115			10
26		127	125			14
27		11	13	4		5
28		9	23	2		7
29		72	70			1
30		77	76			3
31	1	69	67	1		19
32		53	48			9

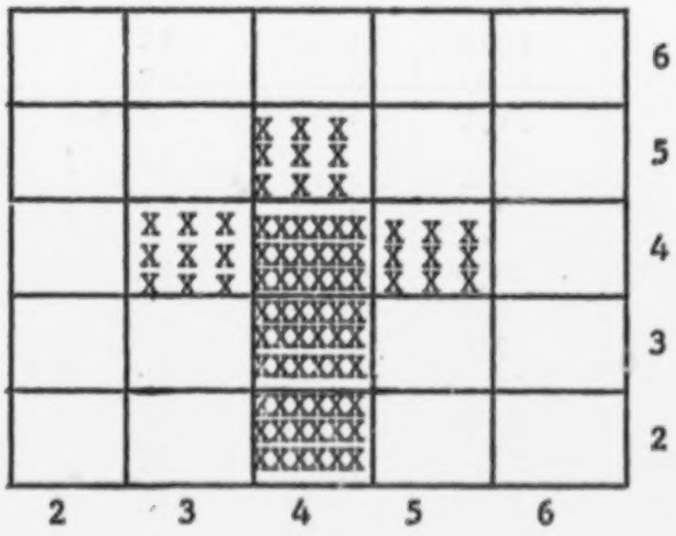
Figure 5-14. -- Role Structure (Central): Duration of Incidents x Lesson

Code Categories

Lesson	1	2	3	4	5	0
1		460	294	13	64	
2		1340	1414	29	112	669
3		653	1124	4		400
4		539	860			80
5		1689	1090	8	4	307
6		1393	1023	23		121
7		1273	866	55		136
8		1020	1040	29		
9		1103	2568	367		410
10		1192	1215			26
11						2897
12		1282	2226			168
13		986	1493			2044
14	1202	1070	1514	21		11
15		889	1198			1445
16		956	1836			221
17		2387	795	22		256
18		2060	1122			3
19	281	2958	405	10		154
20		1860	770	126		723
21		789	1974			24
22		1405	1885			208
23		2699	492			107
24		2428	683	36		363
25	58	1066	1760			656
26		995	1562			893
27		682	923	47		118
28		566	2260	49		133
29		1614	1750			41
30		1834	1500			131
31	4	1606	1049	7		345
32		1769	1184			561

Central Emitter Location (Figures 5-15 and 5-16)

Both Figures 5-15 and 5-16 reveal a similar and intriguingly distinctive pattern in the data that emphasizes the popularity of particular locations. A graphic representation of this pattern is presented in the drawing below. The areas of darkest shading correspond to the locations used most frequently.



Front of Classroom

The relative popularity of locations #24, #34 and #44 (52 percent of incidents and 68 percent of duration) imply that either the teachers as Emitters had a tendency to perambulate up and down the center of the room or else the more vocal students tended to be located along the center line. Interestingly enough, the same pattern was not discernible across the front of the room.

These findings are intriguing, to say the least. Is it possible that pupil emitters, too, are differentially located in the classroom? Or is the "action zone" indicated above exclusively the teacher's? The answers to these questions are given in Figures 5-17 and 5-18 wherein data for incidents involving pupil emitters only (those coded "2, 3, or 4" for emitter role allocation) are given.

Figure 5-15. -- Central Emitter Location: Frequency of Incidents x Lesson

	Code Categories													
Lesson	11	22	23	24	25	26	32	33	34	35	36	42	43	44
1	14			14	12			1	10	5			2	10
2	24		7	97	10	1		23	24	11	5		5	23
3				24	4				19	4	3		2	9
4	48		1	58	17				19				1	21
5	26	1	11	55	5	1	3	8	52	9	6	2	8	46
6	73	1	6	116	2	2	1	2	27	10	2		9	7
7	10			51	3				19				1	10
8	24			78	1			8	14					8
9	3		42	45	6		20	13	27	19		4	5	22
10	3			11	2			9	11	15			9	17
11														
12	50			58	26	2	1	19	40	6	5		18	10
13	16			54	1	2	11	3	15	1	2	7	2	10
14	28	1	2	18	4		9	3	23		2	11	45	5
15	1			51	4		1	4	26	2	5		3	8
16	2		1	72	18		1	7	24	4	21	1	10	25
17	7		12	46	3			4	13	1				3
18	3		[illegible]	36	4	2		4	5	3	1		1	21
29			6	62	62		3	4	9	3	12		1	8
20	1		9	43	27		3	9	17		5	2	4	15
21				12					7	3			2	1
22				24	1				1				1	5
23				66		1		3	29	2			11	23
24	2		1	85	1			7	36	2	2		8	18
25				62	6	2		5	10		19	2	5	20
26	6			60	13			5	33	2	27		12	10
27	3		4	17	3	1			3					
28	19			32	2	1		1	17	2				5
29			2	52			1	1	12	2			11	16
30			3	75	2	3		33	35		5		3	19
31				61				1	7	2	2			
32	17		10	56	3			1	8	2			1	8

Figure 5-15. (continued)

Lesson	45	46	52	53	54	55	56	63	64	65	66	99	0
1	5				5	4						8	11
2	8	5			8	6						30	27
3	2				3				2	4	3	4	15
4	1				5							4	5
5	4	3			14				2			3	16
6	2	1			3							10	8
7	1				7	5			1			7	10
8	1				21	6			1			34	1
9	1			1	8							9	23
10	53											3	3
11													1
12	1	2		31	21	18	6	1				12	10
13		3	9	3	5		1					9	21
14	1	1	9	6	18		2	2				15	4
15	2	2		3	13	3			1	2		6	26
16	1	23		12	34	4	2		3	4	2	1	10
17	3				1							6	10
18	3											3	1
19	2											1	7
20		1	1	3	4	1	1					1	11
21	1				4							1	2
22	10			4	7	7						4	5
23	6				8	4	1		1			7	7
24	13			3	10	6			1			17	11
25	9	4			5	14			1	1		3	11
26	2	6			6	4	2						14
27	4											3	5
28	1			1	7	2						11	7
29	2			4								5	1
30		3										1	3
31				2	58	5						2	20
32	1				7	7							9

Figure 5-16. -- Central Emitter Location: Duration of Incidents x Lesson Code Categories

Lesson	11	15	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46	52
1	92				119	273			7	88	26			15	73	48		
2	185			20	1584	53	15		144	168	42	28		26	192	97	58	
3					1180	21				220	49	24		8	87	10		
4	156			6	566	151				255				35	206	8		
5	139		1	147	1048	15	1	8	94	500	72	40	17	91	409	66	21	
6	192		2	43	1649	11	6	6	3	244	63	5		47	81	11	2	
7	27				1672	38				170				5	90	18		
8	65				1129	22			85	114					99	4		
9	15			420	1224	58		530	241	494	396		73	61	309	11		
10	8				586	97			90	130	313			100	239	825		
11																		
12	238				874	386	5	8	147	533	126	18		201	101	2	5	
13	190				1450	2	4	64	41	249	5	4	42	14	106		54	54
14	232		1	11	225	30		30	11	196		42	77	747	68	2	2	59
15	2				963	15		24	87	348	20	37		18	249	35	16	
16	5			2	799	158		6	52	239	33	346	6	50	263	6	354	
17	199			149	2362	24			41	281	19				42	38		
18	3				2223	29	26		72	66	132	21		22	521	35		
19				54	2365	471		17	33	125	17	180		3	87	15		
20	4			45	1649	326		9	27	190		37	17	84	310		2	2
21					1535					535	212			39	16			
22		3			2013	1				27				32	103			296
23					2651		2		5	165	17			29	141			
24	2			2	2471	1			21	173	12	13		76	115			54
25					1558	10	6		19	203		387	32	39	160	74	24	
26	19				1162	55			40	363	14	379		99	74	17	81	
27	9			36	1059	75	12			84						301		
28	103				1346	31	3		4	350	31				108	116		
29				16	2242			2	35	138	5			432	292	76		
30				30	2136	3	6		382	320		8		20	304		23	
31					1540				6	66	2	3						
32	111			169	1778	71			27	224	36			12	190	7		

Figure 5-16. (continued)

Lesson	53	54	55	56	63	64	65	66	99	0
1		25	28						38	387
2		93	58						132	669
3		41				12	57	24	46	400
4		55							7	80
5		77				16			21	307
6		32							36	122
7		87	30			16			41	136
8		215	81			1			272	4
9	15	102							92	410
10									9	26
11										2897
12	288	292	156	45	4				78	168
13	51	56		44					54	2034
14	75	615		9	4				58	1213
15	20	177	35		[illegible]	15	18		18	1445
16	74	320	25	10		9	14	13	5	221
17		2							46	256
18									32	3
19									5	434
20	11	24	7	1					8	723
21	403								7	24
22	175	371							36	208
23	66	26	2		2				19	107
24	67	28			3				62	363
25		82	223			2	1		5	714
26		58	117	75						892
27									15	118
28	27	332	85						338	133
29	40	37							48	41
30									1	131
31		854	123						52	350
32	15	72	255							561

Figure 5-17, points up the fact with even greater clarity that the pupil emitters are mostly located in the action zone. However, there is one segment of the zone to which the pupils have less access than the teacher. Predictably, it is the direct center front of the room -- location #24. If the five front locations (#22 through #26) are excluded there remain twenty locations that pupil emitters might occupy. While these locations together accounted for some 1176 incidents, 705 or 60% occurred in the three center line locations, #34, #44, #54. If the six locations adjacent to these three are added to them, then the resulting nine locations account for all but four incidents! Once again the data reveal that the closer a pupil is to both the center and front of the room, the more likely he is to be an emitter.

The duration figures in Figure 5-18 confirm this finding unequivocally. They do however provide the additional information that in one or two cases the teacher's territory was invaded. In lesson 31, pupil emitters occupied location #24 for as much as seventeen minutes. In lessons #2, #9, and #23, the occupations were much shorter. They averaged about five minutes.

Figure 5-17. -- Central Emitter Location (pupils only). Frequency Incidents x Lesson

Code Categories

Lesson	11	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46	52	53	54	55	56	62	63	64	65	99	0
1	8				5				4	1				1	2				2	4						8	1
2	19			25				16	8	5			4	13	7	5			6	2						24	1
3				2					9	2				2	2				1						2		1
4	29								13				2	14	1				2							2	
5	13		1	7				1	8	7			3	7	2				2							3	
6	65		3	5					17	4			5	4	1				1							5	
7	44			19					8				1	5	1				5	5						5	
8	21			2				7	8					6	1				13	2						21	
9	2			22	1			10	16	13			2	13	1				6							5	
10	2			5				7	9	10			8	12												3	
11																											
12	35			13			1	12	11	3			11					18	1	13						5	
13	14			4				1	13				2	8	1				3							6	1
14	26				2				18				4	2	1			3	13							9	
15	1							4	14	1			2	5	1	1		2	12	2						5	
16	1							6	14	2	1		6	22	1	7		9	26	4							2
17	7			1				4	9					3	3											5	1
18	2			2				4	4	3			1	18	2											2	
19				1				3	6	1				7	1											1	1
20	1			5				2	9				1	9												0	
21									3	1			1		1				2							1	
22				5									1	3	6			2	4	3						1	1
23				1				2	17	1			19	15	6			5	3							4	
24	2							5	23	2			3	11	10			2	3	4						10	
25								4	8				4	18	8	2			4	13						1	
26	4							5	29	2	1		11	10	2				6	4							
27	3			3					4						3											2	
28	17			3					11					2	1			1								4	5
29				2				1	10	2			10	13	2			3	3							4	
30				1				26	26				3	12												1	
31				54					4									2		4						1	2
32	12			1				1	7	2				7	1				5	5							

Figure 5-18. -- Central Emitter Location (pupils only)
Duration of Incidents x Lesson

	Code Categories															
Lesson	11	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46
1	21				58				15	4				2	10	
2	61			320				78	50	21			12	82	20	20
3				22					87	24				18	5	
4	48								139				30	110	8	
5	47		4	55				11	51	56			18	34	22	
6	163		29	44					146	22			42	57	7	
7	15			152					88				3	36	18	
8	51			3				77	67					68	4	
9	10			298	7			123	160	195			22	147	1	
10	5			210				79	98	197			57	113		
11																
12	137			171			8	112	162	73			96			
13	112			19				17	164				14	59	1	
14	159				8				175				36	20	2	
15	2							41	163	13			15	135	19	4
16	3			9				48	103	11	13		17	210	2	116
17	89			6				21	138					34	38	
18	3			30				49	54	84			12	321	11	
19				32				24	57	4				70	5	
20	4			83				19	108				70	145		
21									327	162			39		5	
22				100					27				30	22	96	
23				248				4	119	1			26	84	41	
24	2							13	101	13			25	72	22	
25								17	154				38	148	66	16
26	8							33	218	12	1		71	74	17	
27	9			39					61						136	
28	89			56					176					60	99	
29				29				26	100	5			175	132	76	
30				3				355	211				12	181		
31				1019					38							
32	64			37				27	113	30				102	7	

Figure 5-18 (continued)

Lesson	52	53	54	55	56	62	63	64	65	66	99	0
1			7	17							32	4
2			65	37							97	3
3			27						23	1		
4			27								2	
5			8								17	
6			27								29	1
7			47	30							22	
8			115	29							176	4
9			80								17	
10											10	
11												
12		119	4	76							36	
13			40								45	34
14		29	344	33							33	
15		8	103	20							15	
16		51	188	25								7
17											25	2
18											23	
19											5	1
20											1	
21			219								7	
22		167	117	231							1	
23			17	12							11	
24		28	21	24							38	
25			80	149							5	
26			36	103								
27											10	
28		26									139	235
29		35	13								48	
30											1	
31		12		90							27	18
32			46	181								

Central Target Location (Figures 5-19 and 5-20)

The patterns exhibited in the Target location data are remarkably similar to the Emitter location ones. The most popular Target Position was 24, implying (correctly) that the teacher frequently occupied the Target role. There is also a tendency for locations #34, #44 and #54 to receive disproportionately large scores. Again, the locations adjacent to the center line of the room are more involved in classroom communication than are those on the outer edges. Three locations (#24, #34, and #44) account for 61 percent of the incidents and 72 percent of the total time during which Targets were in existence.

Again, it may be reasonably asked whether these results stemmed from the fact that the teacher was often in the target role or whether centrally-located pupils were in fact more often the targets of classroom interaction. Figures 5-19 and 5-21 are presented showing data for pupil targets only. As in the case of the location of pupil emitters, pupil targets are almost exclusively confined to the nine center locations. Figures 5-21 and 5-22 give the frequencies of emitter location incidents and duration respectively. Excluding front locations (#22 through #26) there were 822 target incidents. Of these 528 or 64% were located at #34, #44 and #45. Almost all the remaining incidents occurred at locations immediately adjacent to these.

The duration figures are similar. Locations #34, #44 and #54 accounted for 60% of all the target time outside the front locations and virtually none was expended on the fringe locations at all.

It should be remembered, however, that emitter and target information do not necessarily indicate the origin of the particular communication. For example, if three structural changes occurred seriatum during a teacher monologue, the teacher would be coded as an emitter each time. To credit the teacher subsequently with three "initiations" would be fallacious. Again, on another occasion a student might initiate an interaction non-verbally (say by raising a hand). If the teacher speaks first then the teacher is recorded as emitter.

Figure 5-19. -- Target Location: Frequency of Incidents x Lesson

	Code Categories																
Lesson	11	12	13	14	15	21	22	23	24	25	26	31	32	33	34	35	36
1	7								9	11				2	9	5	
2	8						1	4	100	4	1			7	15	8	4
3	4								18	2	1			2	14	5	1
4	2							1	48	13	1		1	1	11	3	
5	2		1		1	2	1	8	29				2	5	25	3	1
6	1							5	107	1				3	2	5	1
7	4								51					2	12	1	
8	6								77					3	2		
9	1	2	2	4				15	32	7		1	17	20	23	18	
10	2								11						6	2	
11																	
12	4								45	15				22	20	8	1
13									54	1	1		3	1	12	3	1
14							1	1	12	4			5	1	5	2	
15									40	3				4	15	2	2
16	3								30	4				4	30	4	6
17								6	35	1				2	4		
18								3	35		1	1			1		
19								1	17	8			1	1	3	2	1
20								3	19	10			1	3	5		2
21									8					3	12	1	
22	1				1				26						10		
23						1			63		1				1	2	
24									72						8	1	
25									50	1	2			8	14		14
26	1							1	50	11			1	4	24	4	16
27	5								10	1					7		
28									33	3	2				1	2	2
29									49					2	9		
30	1						1		70					5	8		
31									64					1	4	2	1
32	1							2	37					1	2	4	

Figure 5.19, (continued)

Lesson	41	42	43	44	45	46	52	53	54	55	56	62	63	64	65	99	0
1			1	9					1								39
2			2	17	5	6			6	2					1	9	136
3			4	14		1	1		6					1	2	5	43
4			1	14	2				5	1						1	62
5	1	1	1	21	2	2		1	6	1	2			1	1	14	77
6			4	9	3											8	115
7				11	2	3			7	1				1		5	73
8				3	2				6							4	80
9		6	5	10	1			1	11					1		8	93
10			4	4	52				1								58
11																	1
12			15	8				17	13	21	6		1	1		7	75
13		1	2	5	1	3	2	2	2	1		1				5	73
14		9	49	5		1	7		3		2				1	3	78
15			3	8	1	3		2	7	3	1				1	3	68
16			5	16		18		7	33	5	1			4	2	1	92
17			1	4												4	41
18				3	1				2								37
19			2	3												1	24
20				8	1				2							1	35
21			3	5	2				9							1	32
22			1	7	4			1	15	8						4	48
23				3					1								68
24			2	6					2							2	76
25			5	22	7	2			10	6	1					7	116
26			3	10	3	3			5	3	1						126
27				3	3											2	15
28		1		9				1	3							2	24
29			2	9												10	71
30			1	10												1	75
31				1					7	1							68
32				6						1							49

Figure 5-20. -- Target Location: Duration of Incidents x Lesson Code Categories

Lesson	11	12	13	14	15	21	22	23	24	25	26	31	32	33	34	35	36
1	62								39	42				6	54	33	
2	22						2	24	917	15	19			44	127	46	10
3	12								175	23	27			5	301	52	11
4	8							1	431	117	1		10	8	74	24	
5	5		11		13	10	5	77	301				7	32	247	18	8
6	2							25	732	3				11	16	36	1
7	56								422					9	126	32	
8	31								899					27	11		
9	3	7	6	18				211	888	90		5	426	162	430	217	
10	11								97						57	11	
11																	
12	17								459	154				247	410	175	3
13									930	2	12		12	6	158	45	3
14							2	3	96	32			24	3	24	5	
15									651	30				44	152	6	6
16	32								158	33				59	414	44	82
17								46	618	9				17	20		
18								36	988		21	2			6		
19								4	222	74			2	12	30	22	3
20								6	474	105			6	147	53		12
21									1196					48	279	40	
22	2				7				1302						76		
23						5			422		24				39	6	
24									503						63	10	
25									675	4	9			83	184		131
26	4							5	551	52			6	80	336	88	85
27	72								418	73					311		
28									1442	39	27				23	192	75
29									1078					30	270		
30							8		1078					34	142		
31									883					12	28	14	7
32	10							29	950					10	19	38	

Figure 5-20. (continued)

Lesson	41	42	43	44	45	46	52	53	54	55	56	62	63	64	65	99	0
1			9	46	2				13								912
2			9	74	16	13			58	22					9	33	2102
3			50	301		4			75					4	40	48	1054
4			2	100	14				55	12						1	618
5	11	2	1	115	8	5		6	42	1	4			1	1	168	1997
6	4		45	75	21				33							45	1514
7				114	17	23			63	7				16		30	1413
8				21	19				28							33	1020
9		82	38	104	1				198					4		47	1514
10			116	42	877			4	4								1213
11																	2897
12			216	57				125	56	254	28		4	1		17	1449
13		3	25	49	39	18	63	7	37	38		4				29	3042
14		264	841	51		4	84		59		32				3	6	2283
15			54	63	5	9		9	108	18	4				18	9	2343
16			25	208		271		52	311	56	1			38	21	10	1194
17			5	46												56	2642
18				21	33				16								2063
19			27	15												3	3394
20				65	4				19							5	2583
21			44	110	47				203							5	813
22			15	73	77			16	189	65						63	1612
23				15					4								2783
24			18	54					59							22	2782
25			66	262	52	19			135	87	2					51	1779
26			24	180	15	33			63	34	7						1881
27				75	66											45	648
28		3		403				70	24							11	700
29			13	243					43							71	1655
30			6	176												24	1965
31				3					101	13							1950
32				175						10							2274

Figure 5-21. -- Target Location (pupils only) : Incidents

Code Categories

Lesson	11	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46	52	53	54	55	56	62	63	64	65	99	0
1	7				2				2	4			1	7					1								
2	7			35				3	3	2				7	2	3			3	2						2	3
3	3			4				2	8	4	1		4	9					4					1	1	3	1
4	2		1	4	1		1	1	9	3			1	8	2				4								2
5	2		5	10				3	9	3			1	4	2			1	4							9	4
6	1		2	12				3	1	3			4	7	3				31							6	1
7	1			18				1	8	1				7	1	3			6	1				1		4	
8	4							2	2					3	2				6							4	
9	1			7			1	10	12	13			1	3					7					1		1	1
10	2			8					6	1			3	4													
11																											
12	1			15				14	11	6			15					8	1	13						7	1
13				19					10	3			1	2	1			2	2	1		1				2	1
14					3				3	2				3					2						1	3	
15				1	1			2	9				2	4					3	2					1	3	3
16	2			4				1	24	3			2	12		8		5	28	6	1						4
17				5				2	4				1	4												4	
18				3										3	1				1								1
19								1	3				1	1													
20				1				1	4					6	1				2							1	
21								2	9	1			2	5	2				6							1	
22	1			1					7				1	5	2				11	7							2
23				1					1	2				13					1								
24				1					6	1			1	2					1							2	
25						1		7	13				3	17	5				9	5	1					4	
26	1			1				4	23	2			3	9	3				4	3							
27	1								7					2	3												1
28				4						2				8					1							1	1
29								2	7				2	8					1							10	
30	1			2				5	8				1	9													1
31				56					2	2	1																
32	1			1				1		3				6						1							1

Figure 5-22. -- Target Location (pupils only) : Duration

Code Categories

Lesson	11	22	23	24	25	26	32	33	34	35	36	42	43	44	45	46
1	31				10				3	19			3	27		
2	16			238	2			25	48	24				48	11	3
3	8			27				5	119	40	9		37	172		
4	8		1	15			8	6	58	25			1	73	14	
5	5		30	83				23	74	18			1	28	8	
6	2		20	62				11	16	26			45	57	19	
7	25			90				4	63	3				82	17	15
8	22							6	9					14	19	
9	3			68			16	61	230	113			13	36		
10	11			67					55	8			94	42		
11																
12	4			106				169	130	127			125			
13				216					91	28			2	5	17	
14					10				12	4				25		
15				3	2			15	63				48	34		
16	30			43				19	239	23			16	126		113
17				24				17	19				5	46		
18				11										18	15	
19								3	24				27	9		
20				1				14	49					53	4	
21								48	197	40			21	74	47	
22	2			19					60				15	40	12	
23				6					20	2				12		
24				26					58	6			6	14		
25						2		44	160				29	187	36	
26	4			2				80	289	47			25	158	16	
27	4								166					37	33	
28				53						106				289		
29								18	138				13	180		
30	30			29				34	85				5	81		
31				647					23	12	7					
32	10			12				10		34				87		

Figure 5-22, (continued)

Lesson	52	53	54	55	56	62	63	64	65	66	99	0
1			13									
2			35	18							18	6
3			59					4	2		7	14
4			32								1	1
5		1	32								103	9
6			31								37	1
7			49	7				11			19	
8			28								33	
9			89					4			7	4
10												
11												
12		74	4	120							18	4
13		2	24	29		4					18	7
14			42						3		7	
15			62	6					14		10	22
16		32	171	39	1							10
17											56	
18			5									6
19												
20			19								5	
21			133								5	
22			143	48							4	28
23			2									
24			6								12	
25			125	59	2						26	
26			48	35								
27												33
28			2								10	18
29			21								64	
30												1
31												
32				10								6

Central Audience Location (Figures 5-23 and 5-24).

The data for Audience location merely confirms the obvious. The Central group, by definition, comprises more than 50 percent of the class members. Given the usual case of a teacher Emitter to a quorum Audience, the Audience location must (except in quite unusual circumstances) be diffuse-diffuse (11). Again, given both the coding systems' bias towards identifying the teachers' role and the teacher's tendency to occupy the front of the room, the use of location 24 also seems obvious. These two locations, 11 and 24, account for 98 percent of all instances of Audience location occupation and for 99 percent of the total time. The inference that can be taken from these data is that independent group work and small group discussions were extremely rare in the classrooms of the sample. Alternatively, it might be inferred that the public nature of many classroom exchanges serves to reconvert peripheral sub-system members immediately (if temporarily) into Central group members again. A further qualification should be added here. By concentrating on the Central group the audience location findings must be biased. However, it will be remembered that from the Communication Structure data that peripheral groups were relatively insignificant.

Figure 5-23. -- Central Audience Location: Frequency of Incidents x Lesson Code Categories

Lesson	11	22	24	25	33	34	35	40	46	54	61	91	99	0
1	24			4										20
2	36												1	35
3	16													16
4	7			1										5
5	20										1			18
6	21		1									1	1	18
7	13		1						1					13
8	7												1	5
9	44		15		2		2	1						39
10	5													3
11														1
12	12									2				10
13	22	1												21
14	3													2
15	27											1	1	26
16	10													10
17	10			1										11
18	3		1											1
19	6		1											7
20	9		4			1								12
21	3													2
22	5													5
23	7													7
24	11		1											11
25	9													10
26	13													14
27	6		2											8
28	6		2											6
29	2													1
30	4													4
31	19													20
32	8													9

Figure 5-24. -- Central Audience Location: Duration of Incidents x Lesson Code Categories

Lesson	11	22	24	25	33	34	35	40	46	54	61	99	0
1	712			42									467
2	3754											1	810
3	1778												404
4	1397			1									80
5	2778										1		318
6	2403		2									15	140
7	2091		39						9				190
8	2054											7	29
9	3219	10	367		38		37	4					781
10	2396				12								26
11													2897
12	3506									4			168
13	2484		5										2034
14	3786												32
15	2072											12	1445
16	2794												221
17	3166			9									285
18	3156		27										3
19	3612		33										164
20	2512		109			8							849
21	2763												24
22	3290												208
23	3192												107
24	3103		7										399
25	2885												656
26	2559												892
27	1414		62										233
28	2737		91										181
29	3365												41
30	3304												161
31	2660												353
32	2953												561

Function, Central and Peripheral (Figures 5-25 through 5-29)

Figures 5-25 and 5-26 present numbers of incidents and duration, respectively, for functional incidents from the central classroom group. Figures 5-27 and 5-28 present the same information for the first peripheral group. In computing percentages, we have excluded from consideration those incidents where the group involved did not exist (coded "00") or where function could not be coded (coded "99"). Because of the complexity of these tables, we have also prepared a summary table in which percentages of incident frequency and duration are presented for mode and content breakdowns. This latter, summary table is numbered 5-29.

The first thing to be noted in Figure 5-29 is the strong dominance of Information Dissemination as the mode of presentation. Within the central group, fully three-fourths of all functional incidents concerned themselves with Information Dissemination, and an equal proportion of time was spent is this same mode. Approximately one-fifth of the time of the central group was spent in Intellectualization, while only two percent of the time involved Operation. (Turning to Figures 5-25 and 5-26, we also note that Operation occurred exclusively at the Grade I level, a fact that is reviewed in detail in the next chapter.) Findings for the first peripheral group are similar excepting only that peripheral groups tended to spend more time involved in Intellectualization, once incidents of this latter type got going. Once again, the dominant picture of the classrooms sampled is that of a traditional presentation of facts, interspersed with infrequent attempts at intellectualization which, interestingly, last for longer periods of time in groups involving less than a quorum of class members.

Turning now to content, we discover that classrooms spent the majority of their effort on Relevant Subject Matter (56.5 percent of incidents in the central group, 78.5 percent of time -- 48.1 percent of incidents in the first peripheral group, 62.2 percent of time). The second most frequent emphasis was Organization, followed by Non-Relevant Subject Matter. Perhaps the most striking of the content findings is the almost infinitesimal amount of time that is devoted to Sociation functions (.5 percent of the time in the central group, 2.2 percent of the time in the first peripheral group). Flanders (1959) has suggested that the classroom is an "affectional desert." We suggest that for our sample, the term emotional desert would seem a more appropriate one. It is also interesting to note that in both the central and first peripheral groups there is a tendency for Organizational incidents to be shorter than Subject Matter Incidents (in the central group an incident rate of 30.3 percent as opposed to 12.9 percent of time spent in Organization -- 26.5 percent versus 14.9 percent in the first peripheral group). Evidently, when groups take up organizational matters they tend to work them through with dispatch. Finally, the first peripheral group is -- reasonably enough -- more than twice as likely to concern itself with Non-Relevant Subject Matter than the central group.

Figure 5-25. -- Function (Central): Frequency of Incidents x Lesson

Code Categories

Lesson	11	12	13	14	21	22	23	24	31	32	33	34	99	0
1	7		1		3	2		14					1	11
2	8	2	2		31	17		35	1				3	27
3	6				35	6	2	44	10	2	1	5	2	15
4	5				18	1		20	12				1	6
5	19		1		32	14	1	38					1	16
6	1				32	9		23	5					7
7	1				20	5	3	29					3	10
8					10	10		9				2	3	
9			2		49	33	26	51	26					23
10					19	13	3	12	5					3
11														1
12					53	10	2	53	34		3	15	4	10
13					34	11		30	1			2		21
14					28	7		16	11			3	1	1
15					42	2		53	22	1		4		26
16					53	2		49	20			5		10
17					18	14		11	9				2	10
18					11	11		10	4	1				2
19					23	3		13	15				1	6
20					10	5	1	12	2					11
21					26			5	23					2
22					23	1		10	14	1			1	5
23					16	6	1	6	7	1	1			7
24					10	14		11	7				2	12
25					49	1	2	21	37					10
26					44	3		18	25				1	14
27					19	5	1	7	16				1	5
28			1		31	6	2	9	26				1	7
29					29	8	1	8	19	1				1
30					29	10	1	6	17	1				3
31					33	4		31	27	1				19
32					25	4		18	24	1				9

Figure 5-26. -- Function (Central): Duration of Incidents x Lesson

Code Categories

Lesson	11	12	13	14	21	22	23	24	31	32	33	34	99	0
1	367		16		57	20		358					11	387
2	330	53	6		1409	460		585	28				24	
3	60				773	130	12	597	127	19	10	39	13	400
4	263				601	1		197	333				2	82
5	664		2		1136	187	2	793					6	307
6	60				1895	120		232	132					121
7	23				1573	138	18	423					18	136
8					1141	266		563				72	48	
9			8		1278	777	206	565	1203					410
10					1630	368	18	180	216					26
11														2892
12					1421	101	18	758	886		41	259	15	168
13					1836	241		354	24			34		2034
14					3265	129		148	231			29	5	11
15					595	35		580	768	5		105		1445
16					1750	17		528	443			56		221
17					1922	506		377	360				36	256
18					2088	719		155	200	12				4
19					2075	429		187	948				15	154
20					2043	183	3	458	70					723
21					1329			67	1365					24
22					2443	27		140	646	30			2	208
23					2664	82	9	195	212	19	10			107
24					2167	358		231	374				12	368
25					1118	58	15	244	1450					656
26					715	15		183	1643				2	893
27					566	188	2	53	687				95	118
28			3		1019	444	18	70	1276				46	133
29					2016	146	12	102	1055	34				41
30					1891	323	27	123	937	33				131
31					776	63		504	1314	8				345
32					1016	24		392	1504	16				561

Figure 5-27. -- Function (Peripheral$_1$): Frequency of Incidents x Lessons

Code Categories

Lesson	11	12	13	14	21	22	23	24	31	32	33	34	99	0
1	2		1		4	2		3					28	33
2			2			9	2	7					89	92
3					4			2	2				23	29
4						1		3	1			1	12	16
5					3	2		4					29	34
6													14	15
7						1							21	21
8													23	24
9													46	47
10														1
11					37	12	3	19	32	2			4	7
12					1	2		2	1				80	81
13						2		2					86	88
14					6			6					62	73
15					6	1		10	7				36	48
16					1			6					32	39
17							1	1					39	39
18													38	38
19													18	18
20													7	7
21													8	9
22					4	1							27	26
23													14	15
24					1	2	1	1					14	17
25		1			2	6	2	7	2				20	31
26			1		9	6	1	5					22	35
27													6	6
28													25	26
29													2	3
30													4	3
31					2		1		2				26	29
32						3		1					54	52

Figure 5-28. -- Function (Peripheral$_1$): Duration of Incidents x Lesson

	Code Categories													
Lesson	11	12	13	14	21	22	23	24	31	32	33	34	99	0
1	30		4		64	23		20					236	843
2			4			117	19	45					898	2481
3					133			12	131				330	1595
4						9		6	14			4	104	1340
5						14		52					236	2764
6													152	2409
7						11							266	2054
8													163	1927
9													764	3692
10														2434
11					946	275	42	304	1192	64			17	55
12					8	24		11	25				724	2885
13						91		35					1829	2568
14					52			28					939	2797
15					64	3		68	175				469	2755
16								52					440	2515
17						38		12					652	2758
18													643	2555
19													237	3571
20													150	3329
21													102	2683
22					44	49							298	3107
23													112	3186
24					10	63	2	6					270	3159
25		4			17	70	19	38	84				163	3144
26			3		53	85	8	58					195	3048
27													112	1597
28													509	2500
29													45	3360
30													117	3348
31					26		12		58				235	2681
32						113		6					914	2481

Figure 5-29. -- Percentages of Codable Functional Incidents by Classification

		Central Group		First Peripheral Group	
		Frequency of Incidents	Duration of Incidents	Frequency of Incidents	Duration of Incidents
Mode	Operation	2.3	2.2	2.6	.9
	Information Dissemination	77.6	75.0	18.8	64.8
	Intellectualization	20.1	22.8	18.6	34.3
Content	Relevant Subject Matter	56.5	78.5	48.1	62.2
	Non-Relevant Subject Matter	10.7	8.1	19.8	20.7
	Sociation	2.5	.5	5.6	2.2
	Organization	30.3	12.9	26.5	14.9

Summary

What have we learned so far about classroom activity from our 32 sampled lessons? Perhaps the easiest way to summarize findings to this point is with a series of propositions.

Proposition 5-1. The Classroom is an ever changing setting. In the average lesson of 3091.2 seconds there are 381.8 activity episodes, or one every 8.1 seconds. (Taking merely one type of activity differentiation, there are 174.3 role allocation incidents in the central group during the same lesson length, or one incident every 17.7 seconds.)

Proposition 5-2. There is a significant, inverse relationship between grade level and activity rate. The greatest number of activities occur in the first grade, fewer in the sixth grade, and fewest in the eleventh grade.

Proposition 5-3. There is a nearly significant relationship between teacher sex and classroom activity rate, male teachers having fewer activities than female teachers.

Proposition 5-4. Classrooms are more variable in activity type than they are in activity rate. All classrooms tend to remain busy, but in some their activities are mostly confined to functional activities, in others they are confined to structural changes.

Proposition 5-5. Central groups dominate the typical classroom, persisting in three-fourths of activity incidents. A single peripheral group exists, however, in one-half of activity incidents, a second group in one-fourth of incidents, and non-involved persons appear in one-half of all incidents.

Proposition 5-6. Peripheral groups and incidents involving non-involved persons last for a shorter time than incidents involving the central group, and as a result appear for shorter periods of time than their frequencies of occurrence would indicatto (one-fifth of the time for the first peripheral group, one-tenth of the time for the second, and one-quarter of the time for non-involved persons).

Proposition 5-7. Teachers dominate the classroom scene, appearing as emitters one-half of the time and as targets one-fourth of the time. Teachers were but rarely members of the audience but were non-involved about one-tenth of the time.

Proposition 5-8. Most of the teacher's effort is also spent in the central group. Teachers appear in the central group more than eight-tenths of the time, in the first peripheral group less than one-tenth of the time, and but negligibly in the second peripheral group.

Proposition 5-9. Teachers are most often in the front of the classroom. Taking the row of locations across the front of the classroom as a whole, teachers appear there in four-tenths of all locational incidents, or for seven-tenths of the total class hour. The rest of the time teachers split nearly equally between walking about the classroom and visiting the center locations.

Proposition 5-10. Three "traditional" patterns of role allocation dominate the central classroom troup: teacher emitter with a quorum audience (four-tenths of the time); single pupil emitter, teacher target, and quorum audience (one-quarter of the time); and teacher emitter, single pupil target, and quorum audience (nearly one-fifth of the time). Nevertheless, a wide variety of different patterns of role allocation also appear, if only transitorily.

Proposition 5-11. The majority of classroom communicators are located down the center of the classroom, rather than across the front or randomly distributed in the classroom. This pattern appears for emitter location, the location of emitting pupils, target location, and the location of target pupils (in the central group). Audiential groups are diffusely located, however. Evidently, pupils along the center columns of the classroom are encouraged to engage in a greater rate of active participation than those to the sides or in the back.

Proposition 5-12. Classroom groups spend more than three-fourths of their time involved in information dissemination, about one-fifth of their time in intellectualization, and very little time in operations.

Proposition 5-13. Once a peripheral group is involved in intellectualization, it tends to persist for longer periods of time than does intellectualization in the central group.

Proposition 5-14. Classroom groups spend approximately one-half of their effort on relevant subject matter, and somewhat less than one-fifth each on organization and non-relevant subject matter. Less than five percent of their effort is spent on sociation.

Proposition 5-15. Organizational incidents are generally dealt with more quickly than subject matter incidents.

Proposition 5-16. Peripheral groups are more likely to involve themselves with non-relevant subject matter than is the central group.

Although there are some exceptions, most of these findings point to a quite traditional classroom form. The teacher is dominant, the central group persists, peripheral groups are transitory, most of the time is spent in information dissemination about relevant subject matter. Although the 32 classrooms sampled were from well-supported schools and were conducted by teachers who would certainly identify themselves with "progressive" rather than "traditional" positions in education, the majority of the findings support a traditional picture of classroom activities.

It should be pointed out nonetheless, that there was considerable variability in classroom strategies followed by these teachers, that teachers were often cast in the role of target (rather than emitter), and that in all classrooms a good deal of intellectualization could be found. If our sample represents the "good end" of contemporary American classroom practice, there is here evidence that the traditional, strict, authoritarian classroom methodology has been softened considerably even if not foresaken.

The most surprising of our findings concerned location of actors. While the teacher tends to be found, at the front of the room, classroom emitters and targets (and particularly, pupil emitters and targets) are found in a row, down the center of the classroom. Using our locational grid, it can be calculated that pupils in locations #34, #44 and #54 tend to participate much more than pupils from the other areas of the classroom. To the extent that active participation may be expected to make a difference to learning, the relationship between locations and learning outcomes seem worthy of serious investigation.

CHAPTER VI

INDEPENDENT VARIABLES AND CLASSROOM ACTIVITY

The purpose of this chapter is to present data examining the effects of four independent variables -- sex and age of the teacher, grade level, and subject matter -- on classroom activities. Tables are first presented in which each of the dependent variable classes is examined for potential independent variable effects. The chapter then concludes with a summary of effects for each independent variable.

It will be recalled that the sample of 32 classrooms examined in this pilot study is approximately balanced for the four independent variables to be examined here. Sex and age of the teacher, and subject matter are in fact balanced for the entire sample, and although there were twice as many eleventh grade classrooms as either those from Grade I or Grade VI, primary and secondary classrooms were balanced. However, sex of teacher and grade level were not balanced against one another. No male, first grade teachers could be found, and only at the sixth and eleventh grade levels can a separation of teacher sex and grade level effects be made.

In this chapter the following comparisons are reported:

1. Grade: Grade I versus Grade VI
   Grade VI versus Grade XI
   Grade I versus Grade XI

2. Age of teacher: Young (under 30) versus old (over forty)

3. Age of Teacher within Grade: Younger versus older (within Grade I)
   Younger versus older (within Grade VI)
   Younger versus older (within Grade XI)

4. Subject Matter: Mathematics versus Social Studies

5. Subject Matter within Grade: Mathematics versus Social Studies (Grade I)
Mathematics versus Social Studies (Grade VI)
Mathematics versus Social Studies (Grade XI)

6. Subject Matter within Age: Mathematics versus Social Studies (Younger)
Mathematics versus Social Studies (Older)

7. Sex of Teacher and Grade: Male versus female (Grade VI)
Male versus female (Grade XI)

8. Sex of Teacher: Male versus female

Data to be reported here stem from six thousand, six hundred and fifty-six t tests. Generally, these tests were of two kinds. In the first test we examined the significance of difference between two proportions, each proportion being calculated as the number of incidents occurring within a given code category compared with the total number of incidents coded for a given variable class. In the second test we again examined the difference between two proportions, only this time we calculated the proportion of the total class hour spent in the code category involved. Results to be presented were significances at $p < .05$ and $p < .01$ (using a two-tailed test). In Figures 6-1 through 6-9, significances are indicated, respectively, by ".05" and ".01," while direction of the results is indicated by the use of a plus or minus sign in front of the entry. A "+" sign in front of an entry indicates that a higher proportionate score was recorded for the independent variable category mentioned in the numerator of the table. A "-" sign indicates that the score for the denominator was greater. An entry of "NS" indicates that a test was made but results were not statistically significant. Blank spaces represent situations in which no test was made, due to lack of n.

Variable Classes

Function

Theoretically, there were three hundred and fifty-two possible significant differences that might have occurred in Figure 6-1. In fact, one hundred and fourteen significant differences appeared. This represents a proportion considerably greater than chance. No significant differences appeared, however, for codes 2.1 (Operation with Non-relevant Subject Matter) and 3.1 (Operation with Sociation). Given the lack of incidents forthcoming in both categories, this finding is not surprising. No runs were made, of course, for code 1.4 (Operation with Organization) where no incidents appeared. Codes 3.2 (Intellectualization about Non-relevant Subject Matter) and 3.3 (Intellectualization about Sociation) produced but one instance each of significant differences at $p < .05$ and will not be interpreted here. We will interpret, however, findings for each of the seven other code categories.

Relevant Subject Matter: Operation (1.1). Interpretation of results here is undoubtedly obfuscated by the failure of any Grade VI or Grade XI classrooms in the sample score in this functional category. The implication is that among the independent variables, grade level exhibited the strongest relationship with Operation with Relevant Subject Matter. Of course, interpretation of this finding must be tempered with the reminder that Grade I teachers were all female, which accounts for the significant (and artifactual) findings

Figure 6-1. -- Function

	Grade						Age		Grade x Age						S-M	
Code Categories	I / VI		VI / XI		I / XI		-30 / +40		-30 / +40 I		VI		XI		Maths. / Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1.1	+.01	+.01			+.01	+.01	-	-	-	+.05					-	-
1.2	-	-			-	-	-	-	-	-					-	-
1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.4																
2.1	-	-	-.05	-.01	-.01	-	-.05	-.01	-	-.01	-.05	-.01	-	-.01	-	-.01
2.2	-	-	-	-	-	-	-	+.01	-.05	-	+.01	+.01	-	+.01	-.01	-.05
2.3	-.01	-	+.01	+.05	-	-	+.01	+.05	-	-	+.01	+.01	-	-	+.01	+.05
2.4	-	+.01	+.01	+.01	+.01	+.01	-	-	-	-	-.05	-	-	-	-	-
3.1	-.01	-.01	-.01	-.01	-.01	-.01	-	-	+.01	+.01	-	+.01	-	-	-	+.01
3.2	-	-	-.05	-	-	-	-	-	-	-	-	-	-	-	-	-
3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.4	-.01	-.05	+.01	+.01	+.01	+.05	-	-	-	-	-	-			-.01	-

__Figure 6-1. (continued)__

	Grade x S-M						Age x S-M				Sex x Grade				Sex	
Code Categories	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1.1	+.05	+.01					-	-	+.01	+.01					-.01	-.01
1.2	-	-					-	-							-	-
1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.4																
2.1	-	-.01	-.05	-.01	-	-.01	-	-.01	-.05	-	-	+.01	-	-.05	+.01	+.01
2.2	-.05	-	-	-	-.01	-.05	-.01	-.05	-	-	+.01	+.01	-.05	-	-	-
2.3	+.05	-	+.01	-	-	-	+.01	+.05	-	-	+.01	+.05	-	-	+.01	-
2.4	+.01	-	-	-	-	-	-	-	-	-	-.05	-.01	-	-	-	-
3.1	-.05	-.01	-.05	-	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.05	-	+.05	+.01	+.01
3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.05	-
3.4	-	-	-.01	-.05			-.05	-.05	-	-	-.01	-.01			-.01	-.01

for Sex of Teacher. It should also be noted, however, that the usage of Operation with Relevant Subject Matter is due almost exclusively to older Teachers in the first grade and appears more often for mathematics than for social studies.

Information Dissemination about Relevant Subject Matter (2.1). Secondary level classrooms recorded significantly more Information Dissemination about Relevant Subject Matter incidents than did either Grade VI or Grade I -- the latter being insignificantly different from one another. (These results might have been spurious due to Grade-Sex interaction; however see below.)

The same tendency was exhibited by classes with older teachers as distinct from those with younger teachers. This finding was consistent over the three grade levels for duration, although when number of incidents become the criterion, the trend is less distinct and indeed, the direction of difference at the secondary level is (non-significantly) reversed.

Again in duration terms, social studies clearly eclipsed mathematics ($p <.01$) both for the sample taken as a whole and for each of the three grade levels taken separately. And again, the findings for the number of incident scores were consistent with the durational information, although with significance dropping to $p <.05$ for Grade VI only. (For Grade XI the direction of difference was reversed, although again not significantly.) In the cross-break between Age and Subject Matter, it turns out that durational information favors social studies for only the younger teachers, while for older teachers mathematics is favored only for number of incidents ($p <.05$).

In classrooms with male teachers there were significantly more incidents and significantly more time was taken for Information Dissemination about Relevant Subject Matter. Given the possibility that this finding is contaminated with Grade Level effects, it is interesting to note that in Grade VI classes male teachers took more time but did not use significantly more incidents for this code category. Interestingly enough, classes with female secondary teachers scored higher on this category ($p < .05$) for duration than did those with men teachers. This last finding would tend to wash out Grade Level findings if those reported above were artifactual. In short, there appears to be a real sex difference in the usage of Information Dissemination about Relevant Subject Matter by Grade Level, and this sex finding is probably independent of Grade Level effects.

Information Dissemination about Non-Relevant Subject Matter (2.2). No grade level differences at all were yielded for this variable.

Classes with younger teachers scored higher on duration for Information Dissemination about Non-Relevant Subject Matter than did classes with older teachers. Grade VI classes confirmed this general trend ($p < .01$ on both counts), and Grade XI did so for duration ($p < .01$). However, classes with older Grade I teachers reversed this order ($p < .05$).

More incidents occurred and more time was spent on Information Dissemination about Non-Relevant Subject Matter in social studies lessons than in mathematics lessons. This general finding was confirmed within Grade I for number of incidents and in Grade XI for both number and duration of incidents. It was also confirmed for younger teachers. It did not appear, however, for older teachers -- suggesting the possibility that older teachers are more organized or restricted in their presentation of social studies.

The overall sex break also revealed no significant differences for Information Dissemination about Non-Relevant Subject Matter, although at Grade VI males scored significantly higher than females on both counts while at the secondary level the number of incident scores for female teachers was higher than those of the men.

Information Dissemination about Sociation (2,3). In general, the scores on Information Dissemination about Sociation favored the middle grade (Grade VI) which was shown to be significantly different from Grade XI (for both number of incidents and duration) and Grade I (for number of incidents). It is unreasonable to assume that this result is produced by Sex of teacher artifact, since a sex-related bias would have produced an emphasis at either Grade I or Grade XI.

When age of teacher becomes the basis for discrimination, classes with younger teachers scored higher on Information Dissemination about Sociation. This characteristic was again pronounced at Grade VI but not at the other levels.

The subject matter crossbreak produced duration and number of incidents scored that were greater for mathematics than for social studies. Analysis by grade level yielded significant scores consistent with the overall trend only for the number of incidents for classrooms with younger teachers but no significant differences for classrooms with older teachers.

Finally, and perhaps unexpectedly, the sex break showed classes with male teachers to be more concerned with Information Dissemination about Sociation (for number of incidents only), and particularly so at Grade VI level (for both number of incidents and duration).

Information Dissemination about Organization (2.4). In all cases the direction of emphasis for Information Dissemination about Organization favored the lower grades. Excepting only the number of incidents in the Grade I vs. Grade VI comparison, significance was exhibited at p <.01 for both duration and number of incidents. Moreover, this finding does not appear to be generated artifactually by Sex of Teacher since no general results for Sex are reported.

The crossbreak for Age showed a significant difference (p <.05) only in the number of incidents and only at Grade VI. The comparison favored the older teachers (for [illegible] significance).

The subject matter crossbreak was equally unproductive in that only duration at Grade I yielded significance (at p <.01).

When Sex of Teacher is examined, it turns out that classes with female teachers were shown to score higher than those with male teachers at the Grade VI level. Interestingly enough, although this finding would produce an artifactive similarity to the Grade Level finding reported above if extended to the entire sample, non-significant results at the Grade XI level show a reversal of emphasis (i.e., favoring Male teachers).

Intellectualization about Relevant Subject Matter (3.1). Out of thirty-two possible differences examined for this code category, twenty-four were found to be statistically significant.

On both duration and number of incidents, analysis shows that the higher the Grade Level the greater the Intellectualization about Relevant Subject Matter. Again, there is the possibility that this may be an artifactual finding (however see below).

No significant difference was shown between the two teacher age groups. However, in the age-grade level comparison, classes with younger Grade I teachers scored significantly higher ($p < .01$ for both counts) than those with older teachers. Grade VI classes with younger teachers reflected the same characteristics for duration only.

The Subject Matter results showed mathematics predominating (at $p < .01$) as far as duration was concerned. This overall finding masks an interesting relationship, however. At Grade I (both counts) and Grade VI (number of incidents only), social studies classes utilized significantly more Intellectualization about Relevant Subject Matter. At the secondary level, however, mathematics scored higher ($p < .01$ on both counts). At least as far as these data are concerned, intellectualization about social studies appears uniquely characteristic of the lower grades, while intellectualization about mathematics appears at the secondary level.

Once again, Sex of Teacher produced significant differences on this variable favoring female teachers (which would tend to confound the Grade results). However, note that this trend was reversed at the Grade VI level where men used Intellectualization about Relevant Subject Matter more than women. Once again, we must conclude that the Grade level results are probably the primary producers of significance.

Intellectualization about Organization (3.4). The middle grade also dominated the score as far as this variable is concerned (and again, this finding tends to rule out artifactive relationships with Sex of teacher.) Grade VI was superior to both Grade I and Grade XI in Intellectualization about Organization and Grade I was superior to Grade XI.

No teacher age significance was revealed for this variable at all.

Social studies classes provided significantly more incidents of Intellectualization about Organization over all. At Grade VI the duration score was also significantly higher for social studies. Moreover, classes with younger teachers (only) showed more and longer Intellectualization about Organization in social studies than in mathematics classes.

The sex break discriminated clearly in favor of female teachers both over the whole sample and at Grade VI.

Communication Structure

Of the four hundred and eighty comparisons made in this variable class, 45 percent revealed significance at either $p < .05$ or .01.

For convenience of interpretation, discussion of findings for Communication Structure will be given in terms of three states of the structure: Centrality is judged when the classroom exhibits only the central group. Residuality is judged when the classroom exhibits non-involved persons. Peripherality is judged when the classroom exhibits peripheral sub-groups. In the comments on Figure 6-2 that follow, this convention will be followed, and groups of codes will be dealt with together. However, from time to time brief mention will be made of some of the more thought-provoking findings from individual code categories.

Centrality. The following significant differences are discernable for centrality, (the existence of the central group only - code 01).

Both Grade I and Grade XI classes exhibit more centrality (incidents and duration) that does Grade VI. Grade XI classes score higher on duration than does Grade I. Since this result is curvilinear, it is unlikely that it was produced by a sex artifact.

Classes with younger teachers also score higher both overall and in Grade VI. At Grade XI, classes with older teachers spent more time with a single central system operation.

Social studies was more centrally-directed than was mathematics, particularly so at Grade VI. Moreover, this tendency was repeated for both younger and older teachers.

The sex break produced an intriguingly inconsistent result. Although there were more centrality incidents among female teachers, there was a greater proportion of time devoted to Centrality by classes with male teachers. The latter finding is probably a Grade Level artifact and was contradicted by results at Grade VI which favored females exclusively.

Residuality. By definition, a residual group comprises classroom members who "appear" to be not attending. Consequently a residue can (and usually does) exist coincidentally with other kinds of groups. Two combinations have been selected for consideration:

(1) central group plus residue (07)

(2) central group plus peripheral, plus residue (12)

There is a certain amount of homogeneity exhibited between the scores on these two variables. Characteristics common to both are reported below:

Both Grade I and Grade VI classes exhibited more Residuality that did Grade XI. This is probably not artifactive since it runs counter to sex (see below).

Classes with older teachers gave evidence of more Residuality on the whole. When the age-grade break was made only one exception to this trend was found (Grade I duration).

Grade VI and Grade XI social studies lessons also produced a greater number of Residue incidents.

The Age of Teacher, Subject Matter crossbreak yielded no significant difference.

The Sex crossbreak produced correspondence between the two Residuality scores. Over the whole sample, classes with male teachers scored higher than classes with female teachers. Grade VI males scored higher than Grade VI females, but on number of incidents, Grade XI female teacher classrooms scored higher than Grade XI male teacher classrooms.

The difference that existed between the two Residuality scores was principally one of degree. Findings were generally of

Figure 6-2. -- Communication Structure

	Grade						Age		Grade x Age						S-M	
Code Categories	I/VI		VI/XI		I/XI		-30/+40		-30/+40 I		VI		XI		Maths./Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1	+.01	+.01	-.01	-.01	-	-.01	+.01	+.01	-	-	+.01	+.01	-	-.01	-.01	-.01
2	-.01	-	-	-	-.01	-	-	-	-	-	+.05	-	-	-	+.01	-
3			-.05	-	-.05	-	-	-					-	-	+.05	-
4	-	-.01	-	+.01	-	-	-	-	-	-	-.01	-.01	-	+.01	+.01	+.01
5	+.01	+.05	-.01	-	-.05	+.01	+.01	+.01	+.05	+.01	+.01	+.05	-	-	-.01	-
6	-	-	-.01	-	-.05	-	-	-	+.01	+.01	-	-	-	-	-	-
7	-	-	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-.01	-	-	-.01	-
8	-.01	-	-	-	-.01	-.01	-	-			-	-	-	-	+.01	+.05
9	-.01	-.01	+.01	+.01	-	+.01	-	+.01	-	-	-	+.01	-	-	+.01	+.01
10	-	-	-	-	-	-	-	-	+.01	+.01	-.01	-.01	-	-	+.05	-
11	-	-	-.01	-	-.01	-	+.01	+.01	-	+.05	+.01	-	-	-	-.01	-
12	-.01	-.01	+.01	+.01	+.01	+.05	-.01	-.01	-.01	-	-.01	-.01	-	-	-	-
13	-	-.01	+.01	+.01	-	-	-.01	-	-.05	-	-.01	-.05	-	-	-	-
14	-.01	-.05	-	+.01	-	-	+.01	+.01	+.01	+.01	+.01	+.01	-	-.05	+.01	+.01
15	-.01	-.01	+.01	+.01	-	-	-.01	-	-	-	-.01	-.01	-	-	-	-

Figure 6-2. (continued)

Code Categories	Grade x S-M						S-M x Age				Grade x Sex				Sex	
	Maths./Soc. St.						Maths./Soc. St.				M/F				M/F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1	-	-.05	-.01	-.01	-	-	-.01	-.01	-.05	-.01	-.01	-.01	-	-	-.01	+.05
2	-	-	+.01	-	-	-	+.05	-	-	-	-.01	-.05	-	-	-	-
3					+.05	-	-	-	-	-			+.05	-	+.05	-
4	-	-	+.01	+.01	+.01	-	+.01	+.05	-.01	-.01	-.05	-	-	+.05	-	+.05
5	-	-	-.01	-.01	-	-	-.01	-.05	-.01	-	-.01	-.01	-	-	-.01	-.01
6	-	-	-	-	-	-	-.01	-	-.01	-	-.05	-.05	+.01	+.05	-	-
7	-	+.05	-.01	-.01	-.05	-	-	-	-	-	+.01	+.01	-.01	-	+.01	-
8			-	-	+.05	-	+.01	-	-	-	-.01	-	-	+.05	-	+.05
9	-	-	+.01	+.01	+.05	-	+.01	+.01	+.01	+.01	-.01	-.01	-	-	-.01	-.01
10	-	-	+.01	-	-	-	-	-	-	-	-.05	-	-	-	-	-
11	-	-	-	-	-.05	-	-.01	-	-.01	-.05	-	-	+.05	-	-	-
12	-	-	-.01	-	-.05	-	-	-	-	-	+.01	+.01	-.05	-	+.01	+.01
13	-	-	-	-	-	-	-	-	-	-	+.01	+.01	-	-	+.01	-
14	-	-	+.01	+.01	-	-	+.01	+.01	+.01	-	-.01	-.01	-	-	-.01	-.01
15	-.05	-	-	-	-.01	-	-	-	-	-	+.01	+.01	-	-	+.01	+.01

the same sign, although in one case or the other significance did not result. In only one instance was the direction of the difference reversed. Grade I teachers of mathematics scored higher (.05 level) than did Grade I teachers of social studies for category 07. No significance was recorded for category 12 where the opposite tendency appeared.

Most noteworthy of the remaining results of this analysis are:

(1) Grade VI teachers scored higher than Grade XI teachers (category 12);

(2) there were more residue incidents for social studies lessons than for mathematics lessons (category 07); and

(3) Grade VI teachers of social studies recorded more instances than Grade VI teachers of mathematics (category 07).

Peripherality. Peripherality as a general concept carries with it several implications. By definition, a peripheral group involves less than 50 percent of classroom members. Consequently under most circumstances peripheral groups are overshadowed by what is occurring in the remainder of the classroom. It has been decided somewhat arbitrarily to use categories 05 (Central plus Peripheral_1), 11 (Central plus Peripheral_1 plus Peripheral_2), and 14 (Peripheral_1 plus Peripheral_2 plus Residue) to provide a basis for judging Peripherality. The correspondence among significance scores of these three categories is not high, although categories 05 and 11 show considerable directional agreement. It appears as if 14, with its residue components, constitutes a separate case.

The following comprise the major points of agreement between categories 05 and 11.

Grade I classes have more peripherality incidents than Grade VI and than Grade XI classes. However, Grade XI classes spend more time with Peripherality manifested.

Classes with younger teachers show more peripherality than those with older teachers. This is so for duration at Grade I and number of incidents at Grade VI.

Social studies classes yield higher scores on Peripherality than do mathematics classes. This finding is replicated for both younger and older teacher sub-sets.

The scores on category 14 reveal significant differences favoring:

Grade VI over Grade I;
Grade VI over Grade XI (duration only);
Younger teachers over older teachers throughout the total
  sample, and in Grades I and VI, but older Grade XI
  teachers over younger Grade XI teachers;
Social studies lessons over mathematics lessons;
Grade VI social studies lessons over Grade VI mathematics lessons;
Younger teachers of social studies over younger teachers of
  mathematics;
Older teachers of social studies over younger teachers of
  mathematics (number of incidents only);
Male teacher classes over female teacher classes; and
Male teacher Grade VI classes over female teacher Grade
  VI classes.

Role Structure

Figure 6-3 reveals findings for comparisons among independent variables for role structure in the central group. It will be recalled from Chapter V that the overwhelming majority of classroom activities evidenced either the familiar emitter-audience role structure or an emitter-target-audience structure. Despite the large number of incidents with those structures, Figure 6-3 reveals a variety of

Figure 6-3. -- Role Structure (Control)

Code Categories	Grade						Age		Grade x Age						S-M	
	I / VI		VI / XI		I / XI		-30 / +40		-30 / +40						Maths, Soc. St.	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1	-	-.01	-	+.01	-	-.01	-	-.01			-	-.01	-	+.1	-	-.01
2	-	+.01	-	-.01	-	-.01	-	-.01	-	-.01	-	-	-	-.5	-	-.01
3	-	-	-	+.05	-	+.05	-	-	-	+.05	-	-	-		-	+.05
4	-	-	+.01	+.05	+.01	-	+.01	+.01	-	-	+.01	+.01	+.01	+.5	-	-
5	+.01	+.01			+.01	+.01	+.01	+.01	+.01	+.01					-	-

Figure 6-3. (continued)

Code Categories	Grade x S-M						Age x S-M				Grade x Sex				Sex	
	Maths./Soc. St.						Maths./Soc. St.				M/F				M/F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1			-	-.01	-	-.05	-	+.05	-.05	-.01	-	+.01	-	+.01	+.05	+.01
2	-	-	-.01	-.01	-	-.01	-	-.01	-	-	-	-	-	-	-	-
3	-	-	-	-.01	-	+.01	-	+.01	-	-.01	-	-	-	-	-	-
4	-	-	+.01	+.01	-	-	+.05	+.01	-.05	-	+.01	+.01	-	-	-	-
5	-	-					-	-	-	-					-.01	-.01

findings for structures not so frequently evidenced, and relatively little for those two structures that are generally so dominant.

Not surprisingly, Grade I was the only grade level to evidence emitter-only groups (code 5), while Grade VI had more audience-only groups (code 1), and emitter-audience groups (code 2) appeared for greater durations at the Grade XI level. These data suggest, then, that "chanting" is uniquely characteristic of the first grade, "witnessing" of the sixth grade, and "lecturing" of the eleventh grade.

It is also interesting to discover that younger teachers are more likely to utilize emitter-target and emitter-only central groups (codes 4 and 5), while older teachers are more likely to exhibit audience-only and emitter-audience central groups (codes 1 and 2). Is it possible that older teachers have greater "audience control"? The same pattern of audience-only and emitter-audience central groups also appears more strongly for social studies classes than for mathematics classes, while male teachers are more likely to use audience-only central groups (a non-artifactive finding that is repeated at both Grades VI and XI).

Role Allocation

It will be recalled that out of the wide variety of role allocation codes that might have appeared, forty-five actually were recorded in the lessons sampled (see Figures 5-11 and 5-12). These forty-five codes were examined for their ability to generate significant differences among lessons classified by independent variables, and the results are displayed in Figure 6-4. However, it will also be recalled that three role allocation patterns accounted for the majority of incidents: 104 (teacher emitter, quorum audience),

Figure 6-4. -- Role Allocation (Control)

	Grade						Age		Age x Grade						S-M	
Code Categories	I/VI		VI/XI		I/XI		-30/+40		-30/+40 I		VI		XI		Maths./Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
101	-	-	-	-	-	-	-	-	-	-			-	-	-	-
103	-.01	-.05	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-.01	-	-	+.01	+.01
104	+.01	+.01	-.01	-.01	-.01	-.01	-	-	-	-.01	+.01	+.05	-	-	-	-.01
107	-	-.05	-	-			-	+.01			-	+.05			-	-.05
110			-	-	-	-	-	-					-	-	-	-
113	-	-	-	-	-	-	-	-			-	-	-	-	-	-
114	-	-			-	-	-	-	-	-					-	-
120	-.05	-.05	-	-	-	-	+.01	+.05	-	-	+.01	+.01	-	-	+.05	-
122	-	-	-	-	-	-	-	-			-	-	-	-	-	+.05
123	-.01	-.01	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-	-	-	+.01	+.01
124	-	+.01	-.01	-.05	-	+.01	+.05	+.01	-.05	-.01	-	-	-	-	+.05	+.01
130	-	-	-	-	-	-	-	-	-	-			-	-	-	-
133	-	-	+.01	-	+.01	+.05	-	-	-.01	-.05	-	-			+.05	-
134	-	-	+.01	-	+.01	+.05	+.05	-	+.05	-	-	-	-	-	-	-.05
140	+.01	+.05			+.01	+.05	-	-	-	-					-	

Figure 6-4. (continued)

	Grade x S-M						Age x S-M				Sex x Grade				Sex	
Code Categories	Maths./Soc. St.						Maths./Soc. St.				M/F				M/F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
101	-	-	+.01	+.01	-	-			-	-			-	-	-	-
103	-	-	-	-.01	-	-	+.05	-	+.01	+.01	+.01	+.01	-.05	-	+.01	+.05
104	-	-	-	-.01	-	-.01	+.01	-.01	-	-	-	-	-	-	-	+.01
107							-	-.05			-	+.05			-	-
110			-	-	-	-	-	-					-	-	-	-
113			-	-	-	-	-	-			-	-	-	-	-	-
114	-	-					-	-							-	-
120	-	-	+.01	+.01	-	-	+.01	-	-	-	+.01	+.01	-	-	+.05	-
122			-	-	-	-	-	-	-	-	-	-	-	-	+.05	-
123	+.01	+.01	+.01	+.01	-	-	+.01	+.01	+.01	+.01	+.01	+.01	-.05	-	+.05	+.05
124	+.05	+.05	-.01	-.01	+.01	+.01	+.05	+.01	-.05	-.01	-.01	-.01	+.01	-	-	-.01
130	-	-			-	-	-	-	-	-			-	-	-	-
133	+.05	-	+.05	-			-	-	-	-	+.05	-			-	-
134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	-	-					-	-	-	-					-.01	-

Figure 6-4. (continued

	Grade						Age		Grade x Age						S-M	
Code Categories	I/VI		VI/XI		I/XI		-30/+40		-30/+40						Maths./Soc. St.	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
143	-	-	-	-	-	-	-	-	-	-			-	-	-	-
203	-	-			-	-	-	-	-	-					-	-
204	-	-	-	-	+.05	-	-	-	+.01	+.05	-	-	-	-	-.05	-.05
207	-	-	-	-	+.05	-	-.01	-.01	+.01	+.01	-.05	+.01	-.01	-.01	-	-.05
210	-.01	-.01	+.05	+.05	-	-	+.01	+.01	-	-	+.01	+.01	+.01	+.05	+.01	+.05
212	-.01	-.01	-	-	-.05	-.05	+.01	+.01			+.01	+.01	-	-	+.05	-
213	-.01	-.01	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-.01	-	-	+.01	+.01
214	-	-	-.01	-.01	-.01	-.01	+.01	-	-	-	+.01	+.01	-	-	-.01	-.05
217	-	-	-	-	-	-	-	-	-	-	-	-			-	-
224	-.01	-.05	+.01	+.05	-	-	-.01	-.05	-	-	-.01	-.05	-	-	-.01	-.05
226	-	-	-	-			-	-			-	-			-	-
227	-.01	-.01	+.01	+.01	-	-	-	-	+.01	-	-	-	-.01	-.05	-.01	-.01
241	-	-	-	-	+.05	+.05	+.05	-	+.05	+.05	-	-			-	-
253			-	-	-	-	-	-					-	-	-	-.05
254	+.05	-			+.05	-	+.05	-	+.05						-.05	-

Figure 6-4. (continued)

Code Categories	Grade x S-M						Age x S-M				Sex x Grade				Sex	
	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
143	-	-			-	-	-	-	-	-			-	-	-	-
203	-	-							-	-					-	-
204	-	-	-	-.05	-	-	-.01	-	-	-	-.05	-	-	-	-.01	-
207	-	-.01	-.01	-.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-	+.01	-	-.01	-
210	-	-	+.01	+.05	-	-	+.01	+.01	-	-	+.01	+.01	-	-	+.01	-
212			+.01	+.05	-	-	+.05	-	-	-	+.01	+.01	-	-	+.01	+.01
213	+.01	+.01	+.01	-	-	-	+.01	+.01	+.01	-	+.01	+.01	-.05	-.05	+.01	+.01
214	-.01	-.01	-	-.01	-.05	-.01	-	-	-	-.01	-	+.05	-.01	-	-	+.01
217	-	-	-	-					-	-	-	-			-	-
224	-	-	-.01	-.01	-	-	-	-	-.01	-.01	-.01	-.01	-	-	-.01	-.01
226			-	-			-	-	-	-	-	-			-	-
227	-.05	-	-.01	-.01	-	-	-.01	-.01	-.01	-.01	-.01	-.01	+.01	+.05	-.01	-.01
241	-.05	-	-	-			-	-			-	-			-.05	-
253					-	-	-	-.05					-	-	-	-
254	-.05	-					-.05	-							-.05	-

Figure 6-4. (continued)

	Grade						Age		Grade x Age						S-M	
Code Categories	I/VI		VI/XI		I/XI		-30/+40		-30/+40						Maths. Soc. St.	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
304			-	-	-	-	-	-					-	-	-	-
306	-	-			-	-	-	-	-	-					-	-
307	-	-	-	-			-	-			-	-			-	-
313	+.05	-	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-.01	-	-	-.01	-.05
314	+.05	-	-	-	-	-	+.01	+.01	+.01	+.01	+.01	+.05	-	-	-.05	-
324			-.05	-	-.05	-	+.05	-			-	-	+.05	-	-	-
326	-	-	+.05	-	-	-	-	-	-	-	-	-			-	-
327	-.01	-	+.01	-	-	-	+.01	-	-	-	+.01	-	-	-	-.01	-
353	-	-			-	-	-	-	-	-					-	-
410	+.01	+.05			+.01	+.05	-	-	-	-					-.01	-
413	+.05	-	-	-	+.01	-	-	-	-	-	-	-			-	-
504	+.05	-			+.05	-	-	-	-	-					-	-
603	+.01	+.01	-	-	+.01	+.01	-.01	-	-.01	-.05	-	-			-	-
604	+.01	+.05			+.01	+.05	+.01	-	+.01	-					-.01	-
700	+.01	+.01			+.01	+.01	+.01	+.01	+.01	+.01					-	-
703	+.01	-			+.01	-	-	-	-	-					-.05	-

Figure 6-4. (continued)

	Grade						Age x S-M				Sex x Grade				Sex	
Code Categories	Maths./Soc. St.						Maths./Soc. St.				M/F				M/F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
304					-	-	-	-					-	-	-	-
306	-	-							-	-					-	-
307			-	-			-	-			-	-			-	-
313	-.01	-.01	-	-	-.05	-	-.01	-.05	-.01	-	+.01	+.01	-	-	-.01	-
314	-.01	-.05	-.01	-.01	+.01	-	-.01	-.05	-.01	-.05	-.01	-.05	-	-	-.01	-
324					-	-	-	-					-	-	-	-
326	-	-	-.05	-			-.05	-	-	-	-.05	-			-.05	-
327	-	-	-.01	-.05	-	-	-.01	-			-.01	-	-	-	-.01	-.05
353	-	-							-	-					-	-
410	-.01	-					-.01	-	-.01	-					-.01	-
413	-	-	-	-			-	-	-.05	-	-	-			-.05	-
504	-	-					-.05	-	-	-					-.05	-
603	-	-	-	-			-.05	-	+.05	-	-	-			-.01	-.01
604	-.01	-					-.01	-	-	-					-.01	-
700	-	-					-	-	-	-					-.01	-.01
703	-.05	-					-.05	-	-	-					-.01	-

124 (teacher emitter, single student target, quorum audience), and 214 (single student emitter, teacher target, quorum audience). Each of these will be dealt with in the text below. Pattern 207 (single pupil emitter, teacher plus quorum audience) will also be reviewed on the assumption that this category, more than others, indicates a situation where the teacher delegates responsibility to students. In addition, a separate summary of patterns characteristic of selected independent variables is given.

104 -- Teacher emitter, quorum audience. Analysis of differences between the sample sub-sets revealed significantly higher scores for:

Grade I over Grade VI;

Grade XI over Grade VI;
   (not artifactive)
Grade XI over Grade I;

Older Grade I teachers over younger Grade I teachers
   (duration only);

Younger Grade VI teachers over older Grade VI teachers;

Social studies over mathematics (duration only);

Grade VI social studies over Grade VI mathematics
   (duration only);

Grade XI social studies over Grade XI mathematics
   (duration only);

Younger teachers of mathematics over younger teachers of
   social studies (number of incidents only);

Younger teachers of social studies over younger teachers
   of mathematics (duration only);

Male teachers over female teachers (duration only).

124 -- Teacher emitter, single student target, quorum audience. Significantly higher scores resulted for:

Grade I over Grade VI (duration only);

Grade XI over Grade VI; ------(Not artifactive)

Grade I over Grade XI (duration only);

Younger teachers over older teachers;

Older Grade I teachers over younger Grade I teachers;

Mathematics lessons over social studies lessons;

Mathematics lessons over social studies lessons at Grade I and Grade XI; but

Social studies over mathematics at Grade VI;

Younger mathematics teachers over younger social studies teachers; but

Older social studies teachers over older mathematics teachers;

Female Grade VI teachers over male Grade VI teachers;

Male Grade XI teachers over female Grade XI teachers (number of incidents only);

Female teachers over male teachers (duration only).

214 -- Single student, teacher target, quorum audience. Significantly higher scores resulted for:

Grade XI over Grade VI;
(probably not artifactive, see below)
Grade XI over Grade I;

Younger teachers over older teachers (number of incidents only);

Younger Grade VI teachers over older Grade VI teachers;

Social studies over mathematics;

Social studies over mathematics at all grade levels excepting duration at Grade VI;

Older social studies teachers over older mathematics teachers;

Male teachers over female teachers (duration only);

Male Grade VI teachers over female Grade VI teachers; but

Female Grade XI teachers over male Grade XI teachers (number of incidents only),

207 -- Single student emitter, teacher plus quorum audience.

Significantly higher scores resulted for:

Grade I over Grade XI (number of incidents only); -- (Possibly artifactive -- see below)

Older teachers over younger teachers;

Younger Grade I teachers over older Grade I teachers;

Younger Grade VI teachers over older Grade I teachers (duration only); but

Older Grade VI teachers over younger Grade VI teachers (number of incidents);

Older Grade XI teachers over younger Grade XI teachers;

Social studies over mathematics (duration only);

Grade I social studies over Grade I mathematics (duration only);

Grade VI social studies over Grade VI mathematics (duration only); but

Grade XI mathematics over Grade XI social studies;

All social studies over mathematics for both young and old teachers;

Female teachers over male teachers; --- (Probably artifactive due to grade)

Male Grade VI teachers over female Grade VI teachers.

Characteristic Patterns. It is also possible to use the data in Figure 6-4 to give a picture of the central group of the "characteristic" classroom by independent variable categories. This is done by abstracting from Figure 6-4 those patterns which occur more frequently for a given grade level, teacher age, subject matter, or teacher sex lesson category -- in comparison with other lessons. Such abstractings are reported in Figure 6-5.

We turn first to the interpretation of grade level results. In Figure 6-5 Grade VI appears as the least typically traditional classroom form with patterns 104 (teacher emitter, quorum audience) and 124 (teacher emitter, pupil target, and quorum audience) appearing less often. In comparison with the other grades, individual pupils are more often emitters at the sixth grade level. Grade I classrooms are characterized by activities in which group emission appears, whether the group be made up of pupils alone or contain the teacher. In addition, they are unlikely to exhibit activities in which a pupil emits to the teacher, observed by a single pupil audience (212). Grade XI activities are not characterized by segmentalization, with a classroom segment appearing either as an audience (103, 133, 213) or as a target (134). However, the teacher at Grade XI clearly stands apart from both segments and the classroom quorum and does not become a "member of the group." (These findings are probably not artifactive, see below).

Turning now to age, we find a more traditional pattern of role allocation appearing among the classrooms of younger teachers. Characteristically, younger teachers are less often outside of the roles of emitter and target, in the central group and pupils are treated either as individuals or as a quorum of the whole. In addition, younger teachers tend to have private as distinct from

Figure 6-5. -- Characteristic Role Allocation Patterns in the Central Group

	Frequently Occurring	Infrequently Occurring
Grade I	124 -- Teacher emitter, pupil target, quorum audience 140 -- Teacher emitter, quorum target 410 -- Quorum emitter, teacher target 413 -- Quorum emitter, teacher target, segment audience 603 -- Teacher + segment emitter, segment audience 604 -- Teacher + segment emitter, quorum audience 700 -- Teacher + quorum emitter 703 -- Teacher + quorum emitter, segment audience	212 -- Pupil emitter, teacher target, pupil target
Grade VI	103 -- Teacher emitter, segment audience 123 -- Teacher emitter, pupil target, segment audience 210 -- Pupil emitter, teacher target 213 -- Pupil emitter, teacher target, segment audience 224 -- Pupil emitter, pupil target, quorum audience 227 -- Pupil emitter, pupil target, teacher + quorum audience	104 -- Teacher emitter, quorum audience 124 -- Teacher emitter, pupil target, quorum audience
Grade XI	104 -- Teacher emitter, quorum audience 123 -- Teacher emitter, pupil target, segment audience 214 -- Pupil emitter, teacher target, quorum audience 313 -- Segment emitter, teacher target, segment audience	103 -- Teacher emitter, segment audience 133 -- Teacher emitter, segment target, segment audience 134 -- Teacher emitter, segment target, quorum audience 213 -- Pupil emitter, teacher target, segment audience

Figure 6-5. (continued)

	Young	Old
Age	120 -- Teacher emitter, pupil target	103 -- Teacher emitter, segment audience
	124 -- Teacher emitter, pupil target, quorum audience	123 -- Teacher emitter, pupil target, segment audience
	210 -- Pupil emitter, teacher target	207 -- Pupil emitter, teacher + quorum audience
	212 -- Pupil emitter, teacher target, pupil audience	213 -- Pupil emitter, teacher target, segment audience
	314 -- Segment emitter, teacher target, quorum audience	224 -- Pupil emitter, pupil target, quorum audience
	700 -- Teacher + quorum emitter	313 -- Segment emitter, teacher target, segment audience
	Mathematics	Social Studies
Subject Matter	103 -- Teacher emitter, segment audience	204 -- Pupil emitter, quorum audience
	123 -- Teacher emitter, pupil target, segment audience	214 -- Pupil emitter, teacher target, quorum audience
	124 -- Teacher emitter, pupil target, quorum audience	224 -- Pupil emitter, pupil target, quorum audience
	210 -- Pupil emitter, teacher target	227 -- Pupil emitter, pupil target, teacher + quorum audience
	213 -- Pupil emitter, teacher target, segment audience	313 -- Segment emitter, teacher target, segment audience
	Male	Female
Sex	103 -- Teacher emitter, segment audience	224 -- Pupil emitter, pupil target, quorum audience
	120 -- Teacher emitter, pupil target	227 -- Pupil emitter, pupil target, teacher + quorum audience
	210 -- Pupil emitter, teacher target	314 -- Segment emitter, teacher target, quorum audience
	212 -- Pupil emitter, teacher target, pupil audience	327 -- Segment emitter, pupil target, teacher + quorum audience
	213 -- Pupil emitter, teacher target, segment audience	

public, tete-a-tetes with their pupils, (120, 210). Older teachers are more likely to create activities involving a segmental audience (103, 123, 213, 313) or a segmental emitter (313), to enter the role of audience member themselves (207), or to allow pupil-pupil interaction to be witnessed by others while they are outside of the central group (224).

Social studies lessons in our sample were surprisingly characterized by pupil emission. Single-pupil emitters appeared (204, 214, 224, 227) as well as pupil-segment emitters (313). By contrast, in mathematics classes, the teacher was more likely to be an emitter (103, 123, 124), and when the individual pupil was an emitter (210, 213) his interaction with the teacher was either unobserved by others or was confined to a classroom segment. Evidently, social studies legitimatizes more pupil initiation, while in mathematics the teacher initiates a greater proportion of activities.

A large number of significant findings appear in Figure 6-4 for teacher sex. Most of these, however, are presumably artifactive and reflect grade level results. Only those findings for teacher sex that appear within Grades VI and XI are summarized in Figure 6-5. Again, it is instructive to learn that women teachers are more tolerant of activities in which pupils emit, either as individuals (224, 227) or as segments (314, 327). Men teachers are more likely to appear as emitters themselves (103, 120), and when pupils do emit the interaction is either unobserved (210) or confined to the observation of but a single pupil (212) or segment (213) of pupil audience members. These findings are so similar to those of the above paragraph as to suggest an artifactive relationship, except that design of the study precluded an artifactive relationship between subject matter and teacher sex. However, they raise a question about the "fit" of teacher sex and subject matter, mathematics being more "male", social studies "female" as now taught. Note also the independence of these results from those reported earlier for grade level.

Teacher Role Assignment

Figure 6-6 reports findings for teacher role assignment comparisons. In part, these are reflective of earlier results obtained under the Role Allocation heading. However, Figure 6-6 is restricted to the teacher's role assignment alone, and in addition Figure 6-6 also reports results for teacher assignment to peripheral groups and non-involvement.

Figure 6-6 is loaded with significant results -- except for teacher assignment to Peripheral Group Two when there were too few cases for significance. Turning first to grade level, we note again the picture of an "untraditional" Grade VI. Sixth grade teachers were less likely to be emitters or targets of the central group, and more likely to be in other roles. Grade I teachers were less likely to be audience members of the Central group or to be emitters, targets, or audience members in the first peripheral group, or to be non-involved. Eleventh grade teachers were difficult to characterize for teacher assignment. (These findings are probably not artifactive -- see below).

Older teachers were somewhat more likely to be involved in the central group, while younger teachers were more likely to be placed in the first peripheral group or be non-involved. (This somewhat modifies our earlier finding that younger teachers were more "traditional" in their roles in the central group, and suggests that the formal creation of peripheral groups may be characteristic of younger teachers, while older teachers are more likely to tolerate, and be involved in, a central group.)

Mathematics and social studies classes were strongly differentiated in teacher role assignment, social studies classes emphasizing teacher involvement in the central group and mathematics classes having the teacher in a peripheral group of being non-involved. If social studies legitimatizes pupil initiation, it also must condone this activity primarily within the context of a single, communicating group.

Finally, although there are findings for teacher sex within Figure 6-6, most of these stem solely from Grade VI and tend to wash out within the data as a whole or be reversed for the eleventh grade. For example, it appears that male teachers are more likely to be targets of the central group and female teachers more likely to be emitters or targets of a peripheral group, but these findings all result from Grade VI effects and are contradicted by findings from Grade XI. We therefore conclude that teacher sex produced few general results for teacher role assignment.

Location

Four separate tables reporting locational comparisons are to

Figure 6-6. -- Teacher Role Assignment

Code Categories	Grade						Age		Grade x Age						S-M	
	I/VI		VI/XI		I/XI		-30/+40		-30/+40						Maths. Soc. St	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1	+.01	+.01	-.01	-.01	-	-	-.01	-	-.01	-.01	-.01	-.01	-	-	-.01	-.01
2	+.01	-	-.01	-.05	-	-	-	-	-.05	-	-.05	-	-	-	-.01	-
3	-	-.01	+.01	+.01	+.01	-	-.01	-.01	+.05	+.01	-.05	+.01	-.01	-.01	-.01	-.01
4	-.01	-.01	+.01	+.01	-	+.01	+.01	+.01	+.01	+.01	+.01	+.01	+.01	-	+.01	+.01
5	-.01	-.01	+.01	+.01	-	+.05	+.01	+.01	+.01	+.01	+.01	+.01	+.05	-	+.01	+.01
6	-.01	-	+.01	-	-.05	-	+.05	-			+.01	-	-	-	+.01	-
7			-	-	-	-	-	-					-	-	-	-
8																
9			-	-	-	-	-	-					-	-	-	-
0	-	-.01	-	+.01	-	-	+.01	-	+.01	+.01	-.01	-.01	+.01	+.01	+.01	+.01

Figure 6-6. (continued)

	Grade x S-M						Age x S-M				Grade x Sex				Sex	
Code Categories	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
1	-	+.01	-.01	-.01	-	-.01	-.01	-.01	-	-	+.01	-	-	-	-	-
2	-.01	-.01	-.01	-.01	-.01	+.05	-.01	-	-	-.01	+.01	+.01	-.01	-	+.01	+.01
3	-	-	-.01	-.01	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-	+.01	-	-	-
4	+.01	+.01	+.01	+.01	+.01	-	+.01	+.01	-	+.01	-.01	-.01	+.05	-	-.01	-.01
5	-	-	+.01	+.01	+.01	+.01	+.01	+.01	-	-	-.01	-.01	+.01	+.01	-.01	-.01
6			+.01	-	-	-	+.01	-	-	-	-	-	+.05	-	-	-
7					-	-	-	-					-	-	-	-
8																
9					-	-	-	-					-	-	-	-
0	+.01	-	+.01	+.01	-	+.05	+.01	+.05	+.01	+.01	-	+.01	-	-	-	-

be reported. Figure 6-7 deals with emitter location, 6-8 with target location, 6-9 with audience location, and 6-10 with teacher location.

Emitter Location. Turning first to Figure 6-7, we find that location of the emitter broke most clearly against grade level. Grade I emitters tended more to be diffusely located (location 11) and to appear at the geographic center of the classroom (location 44). (A diffuse emitter location fits well with the information given in Figure 6-5, that there were more group-emitters at this grade level). Grade XI emitters were front-and-center (location 24) more often than at the other grades, while Grade VI emitters were more likely to be located at a variety of specific locations throughout the classroom (codes 32, 35, 42, 43, 45, 46, 52, 53, 56).

Except for the fact that older teachers were more likely to be located front-and-center (location 24), there was little to report on teacher age differences in Figure 6-5. Subject matter generated nearly as few interpretable differences -- social studies classes were more likely to have diffusely-located emitters (location 11), but mathematics classes followed no interpretable pattern. Finally, there was little or nothing that could be interpreted for teacher sex from Figure 6-7, beyond those findings that appeared to be generated by grade level differences.

These findings for emitter location should be interpreted against two pieces of background information. In Chapter V we observed that teachers were in fact the emitter most of the time, and as a result most of the above findings may be expected to hold also

Figure 6-7. -- Emitter Location

	Grade						Age		Grade x Age						S-M	
Code Categories									-30/+40							
	I/VI		VI/XI		I/XI		-30/+40		I		VI		XI		Maths./Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	+.01	+.01	+.01	+.01	+.01	+.01	-	-	-	-	-	-	+.01	+.05	-.01	-.01
15			-	-	-	-	-	-					-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-			-	-
23	-.05	-	-	-	-	-	+.01	+.05	-	-.01	+.01	+.01	+.05	-	+.01	+.01
24	+.01	+.01	-.01	-.01	-.01	-.01	-.01	-.01	-.01	-.01	-.01	-	-.01	-.01	-	-
25	-	-	-.01	-	-.01	-	+.01	+.01	+.01	+.01	-	-	+.01	+.01	-.01	-.01
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-.01	-.01	+.01	+.01	-	-	-	+.01	-.05	-	-	-.01	-	-	+.01	+.01
33	-.05	-	-	-	-	-	-	-	-	-	+.01	+.01	-.05	-.05	-	-
34	-	-	-	+.05	-	-	-	-	-	-	-	-	-	-	+.01	-
35	-	-.01	+.01	+.01	+.01	-	+.01	+.01	-	-	+.01	+.01	-	-	-	-
36	-.01	-.01	-.05	-	-.01	-.01	+.01	+.01	-	-	-.01	-.01	+.01	+.01	+.01	-
42	-.01	-.01	+.01	+.01	-	-	-.01	-	-	-	-.01	-	-	-	-	-
43	-.01	-.01	+.01	+.01	-.05	-	-.01	-.01	-	-	-.05	-.01	-	-.01	-.01	-.01

Figure 6-7. (continued)

Code Categories	Grade x S-M						S-M x Age				Grade x Sex				Sex	
	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	-.01	-.01	-.01	-.01	+.01	-	-.01	-.01	-.01	-.05	-	-	-.05	-	-.01	-.01
15					-	-			-	-			-	-	-	-
22	-	-	-	-					-	-	-	-			-	-
23	-	-	+.01	+.01	-	-	+.01	-	-	-	+.01	+.01	+.01	+.05	+.01	+.01
24	-.01	-	+.01	+.05	-	-	-	-.01	-	+.01	-.01	-	-	-	-	-
25	-	-	-.01	-.01	-.01	-.01	-.01	-.01	-	+.01	-.01	-.01	+.01	+.01	+.01	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	+.01	+.01	-	-	+.01	+.01	-	-	+.01	+.01	+.01	-	+.01	+.01
33	-.05	-	-	-	+.05	+.01	-	-	-.05	-.01	-	-	+.05	+.01	+.05	-
34	+.01	-	-	-	-	-	+.05	-	+.01	-	-	-	-.01	-	-.01	-.05
35	-	-	-	-	-	-	-	-	-	-	+.01	+.01	-	-	-	+.01
36	-	-	-.05	-.01	+.01	+.01	+.01	+.01	-	-.01	-.01	-.01	+.01	+.01	+.01	+.01
42	-	-	-	-	-	-	-	-	-	-	+.01	+.01	-	-	+.01	+.05
43	-	-	-.01	-.01	-	-	-	-	-.01	-.01	+.01	+.01	-	-	+.01	+.01

Figure 6-7. (continued)

	Grade						Age		Grade x Age						S-M	
Code Categories	I/VI		VI/XI		I/XI		-30/+40		-30/+40						Maths. Soc. St.	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
44	+.05	+.05	-.05	-	-	+.05	-	-	-	-	-	-	-	-	-	-
45	-.01	-.01	-	+.05	-.05	-	+.01	+.01	+.05	-	+.01	+.01	-	-	-.01	-.01
46	-.01	-.01	+.01	+.01	-	-	-.05	-.01	-	-	-.01	-.01	+.05	-	-	-
52	-.01	-.05	+.01	+.05	-	-	-.01	-.05			-.01	-.05	-	-	-	-
53	-.01	-.01	+.01	+.05	-.01	-.01	-	-			-	-	-.05	-.01	-.01	-.01
54	-.01	-.01	-	-	-.05	-	-.01	-.01	-.05	-	-.01	-.01	-.01	-.01	+.05	-
55	-	-	-	-	-.05	-.01	-	-	-	-	+.05	-	-	-.05	-	-
56	-.01	-.05	+.05	-	-.05	-	-	-			-	-	-	-	-.05	-
63	-	-	-	-			-	-			-	-			-	-
64	-	-	-	-	-	-	-	-	-	-	-.05	-	-	-	-	-
65	-	-	+.05	-	-	+.05	-	-	+.05	+.05	-	-	-	-	-	-
66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 6-7. (continued)

Code Categories	Grade x S-M						S-M x Age				Grade x Sex				Sex	
	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
44	+.01	-	-	-	-	-	-	-.01	+.01	-	-	-	-	+.05	-	-
45	-	-	-.01	-.01	-.01	-	-.01	-.05	+.01	+.01	+.01	+.01	-.05	-.01	+.01	-
46	-	-	-.01	-.01	+.01	+.05	-	-	-.01	-.01	-.01	-.01	+.01	+.05	-	-.01
52			-	-	-	-	-	-	-	-	+.01	+.05	-	-	+.01	+.05
53			-.01	-.01	-	-.05	-.01	-.01	-	-	-.01	-.01	-	-	-.05	-
54	-	-	-.01	-.01	+.01	+.01	-	0	-.01	-.01	-.01	-	-	-	-	-
55	-	-	-.01	-.01	-	+.05	-	-	-	-	-.01	-.01	-	+.05	-	-
56			-.05	-	-	-	-	-	-	-	-	-	-	-	-	-
63			-	-			-	-	-	-	-	-			-	-
64	-	-	-	-	-	-	-	-	-	-	-.05	-	-	-	-.01	-.05
65	+.05	-	-	-	-	-	+.05	-	-	-	-.05	-	-	-	-.05	-.05
66	-	-	-	-			-	-	-	-	-	-			-.05	-

for teacher location. (We return to the separation of teacher from non-teacher emitters at the end of this section of the chapter.) In addition, it should also be recalled that most emissions in fact came from front-and-central locations (24, 34, and 44), and that the above findings should be interpreted as tendencies to deviate from the overall pattern.

Target Location. Figure 6-8 gives findings for target location. With two or three exceptions, the results for target location were quite similar to those for emitter location. Once again, targets in the first grade were diffusely located (location 11), and Grade VI targets were more likely to be located at a variety of specific locations throughout the classroom (locations 32, 33, 34, 42, 43, 45, 46, 52, 53, 54, 55). However, Grade XI targets were not more often front-and-center (as were Grade XI emitters), a finding that possibly reflects the tendency for a larger proportion of targets to be pupils at Grade XI.

Once again, findings for targets also suggest that for older teachers there is a stronger likelihood that targets will be found at front-and-center (in location 24). Other findings for teacher age and sex, and for subject matter, appear to be random as far as target location is concerned.

Audience Location. Figure 6-9 reports results for comparisons involving audience location. In contrast with the other locational tables, this one appears distressingly bare. The reason for this, of course, is that the overwhelming majority of audiences were scored as having a diffuse location (code 11). However, findings

Figure 6-8. -- Target Location

Code Categories	Grade						Age		Grade x Age						S-M	
	I/VI		VI/XI		I/XI		-30/+40		-30/+40 I		VI		XI		Maths. Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	+.01	+.01	-	-	+.01	+.01	+.05	-	-	-	-	-	-	-	-	-
12	-	-	-	-			-	-			-	-			-	-
13	-	-	-	-	-	-	-	-	-	-	-	-			-	-
14	-.05	-	+.05	-			+.05	-			_.05	-			+.05	-
15	-	-	-	-	-	-	-	-	-	-			-	-	-	-
21	-	-	-	-	-	-	-	-	-	-			-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	+.05	-	-	+.01	+.05	-	-	+.01	+.01	+.01	-	-	-
24	+.01	+.01	-.01	-.01	-	-.05	-.01	-.01	-.01	-.05	-.05	-	-.01	-.01	-	-
25	-	-	-	-	-	-	+.01	+.01	+.01	+.01	+.05	+.05	+.01	+.01	-	-
26	-	-	-	-	-	-	+.05	-	-	+.05	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-			-	-	-	+.01	-	-
32	-.01	-.01	+.01	+.01	-	-	+.05	+.01	-	-	+.05	+.01	-	-	+.01	+.01
33	-.05	-.01	+.01	+.05	-	-	+.01	+.01	-	-	+.01	+.01	-	-	-	-
34	-.05	-	+.01	+.01	-	-	-	-	-	+.05	-	-	-	-	+.01	+.01
35	-	-	+.01	+.05	+.05	-	+.01	+.01	+.05	-	+.01	+.01	-	-	-	+.01

Figure 6-8. (continued)

	Grade x S-M						S-M x Age				Grade x Sex				Sex	
Code Categories	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur	No.	Dur.	No.	Dur.	No.	Dur.
11	-	-	-.05	-	+.05	+.05	-	-	-	-	-	-	-	-	-.01	-.01
12			-	-			-	-			-	-			-	-
13	-	-	-	-			-	-	-	-	-	-			-	-
14			+.05	-			+.05	-			+.05	-			+.05	-
15	-	-			-	-			-	-			-	-	-	-
21	-	-			-	-			-	-			-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	+.01	+.01	-.01	-	-	-	-	-	+.01	+.01	+.01	+.05	+.05	-
24	-.01	-.01	+.01	+.01	-	+.01	-.01	-	-	-	-	+.05	-.01	-	-.01	+.01
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.05
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31			-	-	-	-	-	-			-	-	-	-	-	-
32	-	-	+.01	+.01	-	-	+.01	+.01	-	-	+.01	+.01	-	-	+.01	+.01
33	-	-	-	-	-	-	-	-	-	-	-	-.05	+.01	+.01	-	-
34	+.01	+.01	-	-	+.01	+.01	+.05	+.01	+.01	-	-.01	-.05	-	-	-	-.01
35	-	-	+.05	-	-	+.01	+.05	+.01	-	-	-	-	-	-	-	-.05

Figure 6-8. (continued)

Code Categories	Grade						Age		Grade x Age						S-M	
	I/VI		VI/XI		I/XI		-30/+40		-30/+40 I		VI		XI		Maths. Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
36	-	-	-.01	-	-.01	-.05	+.01	+.05	-	-	-.05	-.05	+.01	+.01	+.01	+.05
41	-	-			-	-	-	-	-	-					-	-
42	-.01	-.01	+.01	+.01	-	-	-	-	-	-	-	-	-	-	-	-.05
43	-.01	-.01	+.01	+.01	-	-	-.05	-.01	-	-	-.01	-.01	-	-	-.01	-.01
44	+.01	+.01	-.05	-.01	-	-	-	-	-	+.01	-	-	-	-	+.01	+.01
45	-.01	-.01	+.01	+.01	-	-	+.01	+.01	-	-	+.01	+.01	+.05	-	-.01	-.01
46	-.05	-.01	+.01	+.01	+.05	-	-.05	-.01	-	-	-.01	-.01	+.05	-	-	-
52	-.01	-.01	+.01	+.01			-.01	-.01			-.01	-.01			-	-
53	-.01	-.01	+.01	+.05	-	-	-	-	-	-	-	-	-	-	-.01	-
54	-.01	-	+.01	+.01	-	-	-.05	-.05	-	-	-	-	-	-.05	-.05	-
55	-.01	-.01	+.05	-	-.05	-	+.05	+.05	-	-	+.05	-	-	-	-.05	-
56	-.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-			-	-			-	-			-	-
63	-	-	-	-			-	-			-	-			-	-
64	-	-	+.05	-	-	-	-	-	-	-	-	-			-	-
65	-	-	+.05	-	+.05	+.05	-	-	-	-	-.05	-			-	-

Figure 6-8. (continued)

Code Categories	Grade x S-M						S-M x Age				Grade x Sex				Sex	
	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
36	-	-	-	-.05	+.01	+.01	+.01	+.01	-	-	-.05	-.05	+.01	-	+.01	-
41	-	-							-	-					-	-
42	-	-	-	-.01	-	-	+.01	+.05	-	-.01	+.01	+.01	-	-	+.01	+.01
43	-	-	-.01	-.01	-	-	-	-	-.01	-.01	+.01	+.01	-	-	+.01	+.01
44	+.01	+.01	-	-	-	+.01	-	+.01	-	-.05	-	-	-	-	-	-.05
45	-	-	-.01	-.01	-	-	-.01	-.01	+.05	+.05	+.01	+.01	-	-	+.01	+.01
46	-	-	-	-.01	+.05	-	-	-	-	-.01	-.01	-.01	+.05	-	-.01	-.01
52			-	-					-	-	+.01	+.01			+.01	+.05
53	-	-	-.01	-.01	-	-	-.01	-	-	-	-.01	-.01	-	-	-.01	-.01
54	-	-	-.05	-	-	-	-	+.01	-	-	-.01	-	+.05	+.05	-	-
55	-	-	-.01	-.01	-	-	-.05	-	-	-	-.01	-.01	+.01	+.01	-	-
56	-	-	-.05	-	-	-	-	-	-	-	-.01	-	-	-	-	-
62			-	-					-	-	-	-			-	-
63			-	-			-	-			-	-			-	-
64	-	-	-	-			-	-	-	-	-	-			-.05	-
65	-	-	-	-			-	-	-	-	-	-			-.05	-

Figure 6-9. -- Audience Location

Code Categories	Grade						Age		Grade x Age						S-M	
	I/VI		VI/XI		I/XI		-30/+40		-30/+40 I		-30/+40 VI		-30/+40 XI		Maths. Soc. St.	
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	-	+.01	-	-.01	-	-	-	-.01	-	-.01	-	-	-	-	-	-.01
19	-	-	-	-			-	-			-	-			-	-
22	-	-	-	-			-	-	-	-	-	-			-	-
24	-.01	-	-	-	-.01	-	+.01	+.05	+.05	-	+.01	+.05	+.01	-	-	-
25	+.05	-	-	-	-	-	+.05	-					-	-	-	-
33	-	-	-	-			-	-			-	-			-	-
34			-	-	-	-	-	-					-	-	-	-
35	-	-	-	-			-	-			-	-			-	-
40	-	-	-	-			-	-			-	-			-	-
46	-	-			-	-	-	-	-	-					-	-
54	-	-	-	-			-	-			-	-			-	-
61	-	-			-	-	-	-	-	-					-	-
91	-	-	-	-	-	-	-	-	-	-	-	-			-	-
93	-	-			-	-	-	-	-	-					-	-
94	-	-	-	-	-	-	-	-	-	-	-	-			-	-
99	-	-			-	-	-	-	-	-					-	-

Figure 6-9. (continued)

	Grade x S-M						Age x S-M				Grade x Sex				Sex	
Code Categories	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	-	-	-	-	-	-	-	-.01	-	-.01	-	+.05	-	-	-	+.05
19			-	-			-	-			-	-			-	-
22			-	-					-	-	-	-			-	-
24	-	-	+.01	+.05	-	-	-	-	-	-	-	-	-	-	+.01	-
25	-	-			-	-	-	-					-	-	-	-
33			-	-			-	-			-	-			-	-
34					-	-	-	-					-	-	-	-
35			-	-			-	-			-	-			-	-
40			-	-			-	-			-	-			-	-
46	-	-							-	-					-	-
54			-	-			-	-			-	-			-	-
61	-	-							-	-					-	-
91	-	-	-	-					-	-	-	-			-	-
93	-	-							-	-					-	-
94	-	-	-	-					-	-	-	-			-	-
99	-	-					-	-							-	-

may be interpreted both for the diffuse location and for location 24 (front-and-center).

Among the three grade-levels examined, there was a tendency for the audience to be less diffusely located at Grade VI, while fewer incidents appeared within the first grade during which the audience was located front-and-center. (Again, we are reminded that Grade VI classrooms were the least "traditional".) Younger teachers were more likely to have a front-and-center audience, while older teachers stressed a diffuse audience. There was also a tendency for the audience in social studies classes to be more diffuse, and a weak tendency appeared for men teachers to have a more diffuse audience.

Teacher Location. Figure 6-10 reports findings for comparisons involving teacher location. Once again, a wider variety of significant differences appear in this table. For example, it is not surprising to discover that teachers in Grade XI were more likely to appear front-and-center (in location 24) than were teachers at the other two grades. Teachers at Grade I were more likely to be diffusely located (location 11), but only in terms of incident frequency. In terms of duration, teachers in Grade VI were more likely to be diffusely located. The interpretation of these results is not obvious. Recall, however, that teachers in the first grade were more likely to be members of emitter-groups, hence diffusely located. Evidently, incidents involving the teacher as a member of an emitter group are not only more likely at Grade I but also tend to last for but short periods of time. At Grade VI the teacher was more likely to be a member of the audience, and presumably such incidents will last longer than those in which the teacher emits or is a target. It is also instructive to note that our Grade VI classrooms again stood up as being the least traditional, with the teacher being more likely to appear in a variety of specific locations in the classroom (32, 34, 40, 43, 45, 52). Finally, it is useful to note that teachers at the Grade I level were more likely to appear at but a single, specific classroom location -- its exact center (location 44).

Again, relatively fewer findings appear for teacher location when the other independent variables are considered. Older teachers were more likely to be front-and-center (location 24) and to be diffusely located (location 11), while younger teachers were more likely to be located in a variety of specific classroom locations, particularly those in the first-two ranks of the classroom (locations 23, 25, 32, 33, 34, 36, 45). Again, interpreting the greater diffusion in the location of older teachers is difficult, but we have already observed that older teachers were less "traditional" in their activities and were more likely to enter the audiential role.

Little that was interpretable appeared for teacher location when considering subject matter or sex of teacher differences as a whole. However, at Grade VI mathematics teachers were located more often in the center of the room than social studies teachers (who frequented the back of the room more often). At the secondary level, social studies teachers were front-of-the-room occupiers while mathematics teachers ventured further afield. What can be made of findings such as these is moot.

Figure 6-10. -- Teacher Location

Code Categories	Grade						Age		Age x Grade						S-M	
	I/VI		VI/XI		I/XI		-30/+40		-30/+40						Maths./Soc. St	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	+.05	-.01	+.05	+.01	+.01	-	-	-.01	+.01	+.01	-	-.01	-.01	-	-	-
20			-	-	-	-	-	-					-	-	-	-
21	-	-	-	-	-	-	-	-	-	-			-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-.01	-	+.01	+.01	-.05	-	+.01	+.01	-	-	-	+.01
24	-	+.01	-.01	-.01	-.01	-.01	-	-.01	-	-.01	-	-.01	+.01	-.01	-.05	-.01
25	-	-	-.01	-	-.01	-	+.01	+.01	-.01	-.01	-	+.01	+.01	+.01	-.01	-.01
26	-	-	-	-	-	-	-	+.05	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-			-	-	-	-	-	-
32	-.01	-.01	+.01	+.01	-	-	-.01	+.01	-	-	-.01	+.01	-	-	-	+.01
33	-	-	+.01	-	+.01	-	-	+.05	-	-	+.05	-	-	+.05	-	-
34	-	-.01	+.01	+.01	+.01	+.01	-	+.01	-.01	-	+.01	+.01	-	+.05	+.01	+.01
35	-	-	-	-	-	-	-	-	-	-	+.05	+.05	-	-	-	-
36	-.01	-.01	-	-	-.01	-.01	-	+.01	-	-	-.01	-.01	+.01	+.01	-	-

Figure 6-10. (continued)

Code Categories	S-M x Grade						S-M x Age				Sex x Grade				Sex	
	Maths. / Soc. St.						Maths. / Soc. St.				M / F				M / F	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
11	-.01	-	-	-.05	+.01	+.01	-.05	-.01	-.05	-	-.01	-	-	-	-.01	-
20					-	-			-	-			-	-	-	-
21	-	-			-	-	-	-	-	-			-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	+.01	+.01	-	-	-	-	-.05	-	+.01	+.01	-	-	+.01	+.01
24	-.01	-.01	+.05	+.01	-.01	-.01	-	-	-	+.01	-	-	-	-.01	+.05	-
25	-	-	-.01	-.01	-.01	-.05	-.01	-.01	-.05	-.05	-	-.01	+.01	-	+.01	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27			-	-	-	-			-	-	-	-	-	-	-	-
32			-	+.01	-	-	-	+.01	-	-	+.01	+.01	+.01	-	+.01	+.01
33	-	-	+.05	+.05	-	-	+.05	-	-	-	+.05	-	-	-	-	-
34	+.01	+.01	+.01	+.01	-.05	-	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-	-.01	-.01
35	-	-	-	-	-	-	+.05	-	-	-	-	-	-	-	-	-
36	-	-	-.01	-.01	+.01	+.01	+.01	+.01	-.01	-.01	-.01	-.01	+.01	+.01	+.01	-

Figure 6-10. (continued)

	Grade						Age		Age x Grade						S-M	
Code Cate-gories	I/VI		VI/XI		I/XI		-30/+40		-30/+40						Maths./Soc. St	
									I		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
42	-.01	-.01	+.01	+.01	-	-	-.01	-.05	-	-	-.01	-.01	-	-	-	-
43	-	-.01	-	_.01	-	+.05	-	-.05	-	-	-	-.01	-	-	-	-.01
44	+.01	+.01	-	+.05	+.01	+.01	-	-	-.01	-	+.01	-	-	-	+.01	+.05
45	-	-.01	-	+.01	-	+.05	+.01	+.01	-	-	+.01	+.01	-	-	-	-.01
46	-	-	-	+.05	-	-	-	-	-	-	-.01	-.01	-	-	-	-
52	-.01	-.01	+.01	+.01	-	-	-.01	-.01			-.01	-.01	-	-	-	-
53	-.01	-	-	-	-	-	-	-			-	-	-	-	-	-
54	-	-	-.01	-	-.01	-	-.01	-.01	-	-	+.01	+.05	-.01	-.01	+.01	+.01
55	-	-	-	-	-	-	+.05	-	+.01	+.05	-	-	-	-	-	-
56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	-	-	-	-			-	-			-	-			-	-
64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	-	-	+.01	+.01	-	-	-	-	+.05	+.05	-.01	-.01	-	-	+.01	+.01
66	-	-	-	-	-	-	-	-	-	-	-	-			-	-

Figure 6-10. (continued)

	S-M x Grade						S-M x Age				Sex x Grade				Sex	
Code Categories	$\frac{\text{Maths.}}{\text{Soc. St.}}$						$\frac{\text{Maths.}}{\text{Soc. St.}}$				$\frac{M}{F}$				$\frac{M}{F}$	
	I		VI		XI		-30		+40		VI		XI			
	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.	No.	Dur.
42	-	-	-	-.05	-	-	-	-	-	-.05	+.01	+.01	-	-	+.01	+.01
43	-	+.05	-	-.01	-	-	-	-	-	-.01	+.01	+.01	-	-	-	+.01
44	+.01	+.01	-	-	-	-	+.05	-	+.01	+.05	-	-	-.05	-	-.01	-.01
45	-	-	-.05	-.01	-	-	-	-.01	+.05	-	+.01	+.01	-	-	-	+.01
46	-	-	-.05	-	+.01	-	-	-	-.05	-	-	-.05	+.01	-	-	-
52			-	-	-	-	-	-	-	-	+.01	+.01	-	-	+.01	+.01
53			-	-	-	-	-	-	-	-	-	-	-	-	-	-
54	+.01	-	-.05	-.01	+.01	+.01	-	-	-.01	-.01	-.01	-.01	-	-	-	-
55	-	-	-	-	-	-	-	-	+.01	+.01	-.05	-.05	-	-	-.05	-
56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63			-	-			-	-	-	-	-	-			-	-
64	+.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-.05	-
65	+.05	+.05	-	+.05	-	-	+.05	-	-	+.05	-.01	-.01	-	-	-.01	-.01
66	-	-	-	-			-	-	-	-	-	-			-	-

Summary

We turn now to a discussion of findings and their implications for each of the independent variables of the study. As was true in Chapter V, major findings will be summarized by use of propositions. The reader is cautioned, once again, to remember that propositions of this chapter report tendencies with which classrooms of one type may be differentiated from classrooms of another type. These tendencies do not mitigate the overall findings reported in Chapter V. For example, in Chapter V we discovered that teachers were likely to be found at the front of the classroom, while pupil-emitters and targets were most likely to be located down the central file of the classroom. These findings hold for all grade levels, subject matters, etc. However, it is also true that within this general trend, Grade I emitters are more likely to be located at the geographic center of the classroom, Grade VI teachers are more likely to appear in a variety of specific locations in the classroom, etc.

Grade Level

Grade I. Eleven propositions may be stated summarizing data wherein Grade I was differentiated from classrooms at the other grade levels.

Proposition 6-1. Grade I exhibits more Operation with Relevant Subject Matter (indeed, the other grades exhibit none whatsoever).

Proposition 6-2. Grade I exhibits more Information Dissemination about Organization than do the other grades (and Grade VI more than Grade XI).

Proposition 6-3. Grade I classrooms exhibit more peripherality incidents in their communication structure than do Grades VI or XI.

Proposition 6-4. Grade I classes exhibit more emitter-only central groups (indeed, the other grades exhibit none whatsoever).

Proposition 6-5. Grade I exhibits more emitting by groups of pupils than do Grades VI or XI.

Proposition 6-6. Grade I teachers are more likely to be emitters or targets of the central group, and less likely to be involved in peripheral activity or be non-involved than teachers at Grades VI or XI.

Proposition 6-7. Grade I emitters tend more to be located diffusely than do emitters at Grades VI and XI,

Proposition 6-8. Grade I emitters tend more to be located at the geographic center of the classroom than do emitters at Grades VI and XI.

Proposition 6-9. Grade I targets tend more to be located diffusely than do targets at Grades VI and XI.

Proposition 6-10. Grade I classrooms exhibit fewer incidents during which the audience is located front-and-center than do Grades VI and XI.

Proposition 6-11. Grade I teachers are more likely to exhibit incidents in which they are diffusely located (as members of emitter groups) than are teachers at Grades VI or XI.

What, then, are the implications of being a participant in a Grade I classroom? Life in a first grade classroom requires more overt educational activity than appears in the upper grades. Grade I members spend more time in operation (with relevant subject matter) and more time disseminating information about the organization of the classroom. Group-participation is also a unique characteristic of Grade I. The first grade exhibits more emitter-only groups (that is, more "chanting type activities"), and more group emitting by pupils. Teachers, too, participate in pupil groups, both as emitters and as targets and audience members. Interestingly, although a variety of peripheral groups tend to appear at the first grade level, their appearance is short-lived, and the overall tendency is for first-grade activities to be centralized. Of necessity, emitters, targets, and audiences in the first grade tend to be located diffusely throughout the room. And, interestingly, first-grade emitters tend to appear at the geographic center of the classroom.

Grade VI. Thirteen propositions may be stated summarizing ways in which Grade VI is differentiated from Grades I and XI. In itself, this is an interesting finding. One might assume, naively, that Grades I and XI represented the two ends of a variety of continuua, with Grade VI generally occupying various mid-points. This is simply not the case in the data reported here. In fact, slightly more significant comparisons were generated in comparing Grade VI with each of the other two grades than were found when comparing Grades I and XI. What, then, are the substantive findings that make up these comparisons?

Proposition 6-12. Grade VI exhibits more Information Dissemination about Sociation than do the other grades.

Proposition 6-13. Grade VI exhibits more Intellectualization about Organization than do Grades I and XI.

Proposition 6-14. Grade VI exhibits less centrality of its communication structure than do Grades I or XI.

Proposition 6-15. Grade VI classrooms exhibit more peripherality duration in their communication structure than do Grades I or XI.

Proposition 6-16. Grade VI exhibits more audience-only central groups than do either Grades I or XI.

Proposition 6-17. Grade VI exhibits fewer role allocations of a traditional nature (i.e., those involving a teacher emitter and a pupil quorum audience) than do Grades I or XI.

Proposition 6-18. Grade VI exhibits more emitting by individual pupils than do Grades I or XI.

Proposition 6-19. Grade VI teachers are less likely to be emitters or targets within the central group than are teachers at Grades I or XI.

Proposition 6-20. Grade VI emitters tend to be located at a variety of specific locations throughout the classroom, in comparison with Grades I and XI.

Proposition 6-21. Grade VI targets tend to be located at a variety of specific locations throughout the classroom, in comparison with Grades I and XI.

Proposition 6-22. Grade VI classrooms exhibit less time during which the audience is located diffusely than do Grades I and XI.

Proposition 6-23. Grade VI teachers are more likely to spend time diffusely located (as members of audiential groups) than are teachers in Grades I or XI.

Proposition 6-24. Grade VI teachers are more likely to appear in a variety of specific locations in the classroom than are Grade I or XI teachers.

To summarize the Grade VI findings, participants at this level experience classroom life somewhat differently than their junior and senior counterparts. In their classrooms there are significantly more exchanges concerned with the rationalization of organizational procedures. Presumably, where Grade I students had to "do," Grade VI pupils have to both do and appreciate why. (At Grade XI, it seems, organizational matters are simply no longer an issue.) Grade VI is also unique for its concern with sociation; apparently first grade pupils are too young for involvement with sociation, while by the time they are juniors in high school it is "no longer necessary" to concern oneself with matters of sociation. (Recall also, from the findings of Chapter V, how very little classroom effort was spent on sociation at any grade level.)

At several points, it has been suggested that Grade VI classrooms are the least "traditional" of those studied. Grade VI classrooms evidence less centrality in communication structure, a greater portion of time spent in peripheral communication structures, fewer role allocations involving a teacher emitter and a pupil quorum audience, more emitting by individual pupils, and their emitters and targets tended more to be located at a variety of specific locations throughout the classroom. Grade VI teachers are less likely to be emitters or targets within the central group, are more likely to spend time diffusely located as members of audiential groups, and are more likely to appear in a variety of specific locations in the classroom. Finally, Grade VI classrooms exhibit more audience-only central groups than do either of the other grades; that is, groups that are paying collective attention to a non-human stimulus source such as the chalk board or a television set.

Grade XI. Eight propositions may be stated for Grade XI.

Proposition 6-25. Grade XI classrooms exhibit more Information Dissemination about Relevant Subject Matter than do the other grades.

Proposition 6-26. Grade XI exhibits more Intellectualization about Relevant Subject Matter than do the other grades (and Grade VI more than Grade I).

Proposition 6-27. Grade XI exhibits less residuality of its communication structure than do Grades I and VI.

Proposition 6-28. Grade XI exhibits more emitter-audience duration in the central group than do either Grades I or VI.

Proposition 6-29. Grade XI exhibits less segmentalization (with the segment appearing either as target or audience) than do either Grades I or VI.

Proposition 6-30. Grade XI teachers are less likely to join emitter, target, and audience groups than teachers at Grades I or VI.

Proposition 6-31. Grade XI emitters are more likely to be located front-and-center than are emitters at Grades I and VI.

Proposition 6-32. Grade XI teachers are more likely to be located front-and-center than are teachers at Grades I or VI.

In contrast with the lower grades, classrooms at the Grade XI level are subject matter oriented. More information is disseminated about relevant subject matter, and more intellectualization takes place about the same issues. To the extent, then, that subject matter acquisition is seen as a goal of education, our classrooms evidence a sequence in which pupils are trained, successfully, for the eventual task they must take on -- the intense focusing on subject matter characteristic of secondary classrooms. There is additional evidence, of course, of the centrality and control of the Grade XI classroom. Classrooms at the eleventh grade evidence less residuality and less segmentalization of their communication structures, and a greater duration of the emitter-audience role structure in the central group. In addition, emitters, (primarily teachers) are more likely to be found front-and-center in Grade XI classrooms, and teachers themselves are less likely to join emitter, target, or audience groups of pupils than they are at the lower grades.

Age of Teacher

One looks far and wide in the literature on teaching before one finds many observations about variations in classroom phenomena by age of the teacher. (For an exception to this generalization, see Peterson, 1964). It comes as a considerable surprise, therefore, to discover that this independent variable not only generated differences, but that these were numerous and wide-spread among the dependent variable classes. Evidently, there are sharp differences in the role, mobility, classroom activities, and reactions of pupils to younger and older teachers.

Eighteen propositions relating to the age of the teacher were derived from the findings.

Proposition 6-33. Older teachers' classroom (in Grade I) exhibit more Operation with Relevant Subject Matter than do younger teachers.

Proposition 6-34. Older teachers' classrooms exhibit more Information Dissemination about Relevant Subject Matter than do younger teachers.

Proposition 6-35. Younger teachers' classrooms exhibit more Information Dissemination about Non-relevant Subject Matter than do older teachers.

Proposition 6-36. Younger teachers' classrooms (particularly at Grade VI) exhibit more Information Dissemination about Sociation than do older teachers.

Proposition 6-37. Younger teachers' classrooms (at Grades I and VI only) exhibit more Intellectualization about Relevant Subject Matter than do older teachers.

Proposition 6-38. Younger teachers' classrooms (at Grade VI only) exhibit more centrality of communication structure than do older teachers.

Proposition 6-39. Older teachers' classrooms exhibit more residuality of their communication structure than do younger teachers.

Proposition 6-40. Younger teachers' classrooms exhibit more peripherality in their communication structure than do older teachers.

Proposition 6-41. Younger teachers' classrooms exhibit more emitter-oriented and older teachers more audience-oriented central groups.

Proposition 6-42. Younger teachers are less often outside of the roles of emitter and target in the central group than are older teachers.

Proposition 6-43. Younger teachers are more likely to have private tete-a-tetes with their pupils than are older teachers.

Proposition 6-44. Older teachers are more likely to create activities involving segments of the classroom than are younger teachers, while the latter are more likely to treat pupils as individuals or as a quorum of the whole.

Proposition 6-45. Older teachers are more likely to enter the role of audience member than are younger teachers.

Proposition 6-46. Older teachers are more likely to be involved in the central group, younger teachers are more likely to be peripherally involved or non-involved.

Proposition 6-47. Older teachers' are more likely to have emitters who are located front-and-center than are younger teachers' classrooms.

Proposition 6-48. Older teachers' classrooms are more likely to have targets that are located front-and-center than are younger teachers' classrooms.

Proposition 6-49. Younger teachers' classrooms are more likely to have a front-and-center audience, older teachers' classrooms to have a diffuse audience.

Proposition 6-50. Older teachers are more likely to be front-and-center, while younger teachers are more likely to be located in a variety of specific classroom locations, particularly those towards the front of the room.

At least in terms of functional distinctions, the classrooms of older teachers appear to be more traditional, more controlled. Older teachers' classrooms exhibit more operation with and information dissemination about relevant subject matter than do younger teachers' classrooms. In contrast, younger teachers' classrooms are more likely to intellectualize about relevant subject matter than their older teacher counterparts. They are also, however, more likely to disseminate information about non-relevant subject matter and about sociation (although their usage of sociation can hardly be called "overwhelming").

Turning now to structural properties, younger teachers' classrooms are more likely to exhibit both centrality and peripherality in their communication structures, while older teachers' classrooms exhibit greater residuality. The central groups in younger teachers' classrooms are more likely to be emitter-oriented, those in older teachers' classrooms more likely to be audience-oriented. In addition, younger teachers are less often outside the roles of emitter or target in the central group and are more likely to have tete-a-tetes with their pupils than are older teachers.

To the extent that a single summary is meaningful, the picture one obtains from these data is of energy and expansiveness on the part of younger teachers' classrooms, control and discipline on the part of the older teachers' classrooms. Older teachers are more likely to be involved in the central group (as members of the audience), younger teachers to be peripherally involved or non-involved. Older teachers are more likely to create activities involving segments of the classroom than are younger teachers, while the latter are more likely to treat pupils as individuals or as a quorum of the whole. Older teachers are more likely to be located front-and-center and to have emitters and targets who are also front-and-center, although their audiences are more likely to be diffuse. Younger teachers are more likely to be located in a variety of specific classroom locations, particularly those towards the front of the room.

Subject Matter

Subject matter, too, generated a wide variety of significant differences in classroom activity characteristics -- fifteen in all.

Proposition 6-51. Mathematics classes (at Grade I level) exhibit more Operation with Relevant Subject Matter than do social studies classes.

Proposition 6-52. Social studies classes exhibit more Information Dissemination about Relevant Subject Matter than do mathematics classes.

Proposition 6-53. Social studies classes exhibit more Information Dissemination about Non-relevant Subject Matter than do mathematics classes.

Proposition 6-54. Mathematics classes exhibit more

Information Dissemination about Sociation than do social studies classes.

Proposition 6-55. Social studies classes (at Grade I and VI) exhibit more Intellectualization about Relevant Subject Matter than do mathematics classes.

Proposition 6-56. Mathematics classes (at Grade XI) exhibit more Intellectualization about Relevant Subject Matter than do social studies classes.

Proposition 6-57. Social studies classes exhibit more Intellectualization about Organization than do mathematics classes.

Proposition 6-58. Social studies classes exhibit more centrality of their communication structures than do mathematics classes.

Proposition 6-59. Social studies classes (at Grades VI and XI) exhibit more residuality of their communication structure than do mathematics classes.

Proposition 6-60. Social studies classes exhibit more peripherality in their communication structure than do mathematics classes.

Proposition 6-61. Social studies classes exhibit more audience-oriented central groups than do mathematics classes.

Proposition 6-62. Mathematics classes exhibit more activities in which the teacher is an emitter (as opposed to pupil emitters) than do social studies classes.

Proposition 6-63. Social studies classes exhibit more teacher involvement in the central group; in mathematics classes the teacher is more likely to be in peripheral groups or to be non-involved.

Proposition 6-64. Social studies classes are likely to have emitters who are more diffusely located, in comparison with mathematics classes.

Proposition 6-65. Social studies classes are more likely to exhibit a diffuse audience than mathematics classes.

Turning first to relevant subject matter, mathematics classes exhibit more operation (first grade evidence only), social studies more information dissemination. An interesting reversal appears for relevant subject matter intellectualization; social studies classes are more likely to be intellectual at Grades I and VI, mathematics at Grade XI. Evidently, within this sample of classrooms mathematics is taught for "understanding" primarily at the secondary level. Reasonably enough, social studies classes have greater difficulty "sticking to the subject" -- are more likely to exhibit information dissemination about non-relevant subject matter and organizational matters than are mathematics classes. However, a non-obvious finding obtains for sociation; mathematics classes disseminate more information about sociation than do social studies classes. Whether this finding is accidental or suggestive of a relationship between a restricted curriculum and freedom to turn to matters of sociation remains for further studies to elucidate.

Interestingly, social studies classes exhibit more centrality, residuality (at Grades VI and XI), and more peripherality of their structures than do mathematics classes -- the latter evidencing non-standard structures. Social studies classes exhibit more audience-centeredness in their central groups, more teacher involvement in the central group, emitters who are more diffusely located, and a more diffuse audience than mathematics classes. Evidently, as taught in the sample of classrooms studied, social studies are taught more "traditionally," while mathematics classes involve a wider variety of techniques and groupings. This conclusion is jarred, somewhat, however, by the finding that mathematics classes exhibit more activities in which the teacher is an emitter (as opposed to pupil emitters). Evidently, although mathematics classes use a wider variety of activities, the variations share in common the need for curricular control by the teacher.

Teacher Sex

As has been suggested, the apparently gross number of significant findings that appear in the tables of this chapter for teacher sex have the annoying habit of turning out to be grade-level artifacts. Consequently, only six propositions have been drawn from findings that reflect "true" teacher sex differences (that is, those that appear within Grades VI, XI, or both). Three of these findings deal with functional differences.

Proposition 6-66. Men teachers' classrooms exhibit more Information Dissemination about Relevant Subject Matter than do women teachers.

Proposition 6-67. Men teachers' classrooms (particularly at Grade VI) exhibit more Information Dissemination about Sociation than do women teachers.

Proposition 6-68. Women teachers' classrooms exhibit more Intellectualization about Organization than do men teachers.

Proposition 6-69. Men teachers' classrooms exhibit more residuality of communication structure than do women teachers.

Proposition 6-70. Men teachers' classrooms exhibit more audience-only central groups than do women teachers.

Proposition 6-71. Men teachers are more likely to be emitters than are women teachers (in these classrooms pupils are more likely to be emitters).

Given conventional (male) prejudice, it is not surprising to discover that men teachers' classrooms exhibit more information dissemination about relevant subject matter than do women teachers' classrooms while women teachers' classrooms spend more effort intellectualizing about organizational matters. However, it comes as a surprise to discover that men teachers' classrooms (particularly at Grade VI) exhibit more information dissemination about sociation than do women. Is this an accidental finding, or are men teachers truly more willing to have sociation matters discussed in the classroom?

There is also some evidence that male teachers' classrooms were more centrally organized than those of women teachers' classrooms. Men teachers' classrooms exhibit more audience-only central groups, more residuality of the communication structure, and more activities in which the teacher is an emitter. (In women's classrooms, pupils are more likely to be emitters.)

The Independent Variables in Comparison

What, then, are the relative strengths of the four, independent variable classes for generating significant differences in classroom activities? This question is a meaningful one but difficult to answer with any assurance. One answer may be given, however, by counting the numbers of significant differences appearing in Figures 6-1 through 6-10 by independent and dependent variable classes. Results from such a count are presented in Figure 6-11. (Note that in this table two sets of figures are given for Sex of Teacher. The first figures are the raw ones taken directly from Figures 6-1 through 6-10. The second set was "corrected" by subtracting from the raw figures those which appeared to reflect spurious grade-level effects; i.e., those which could not be confirmed within Grades VI or XI without disconfirmation at the other grade level. A similar "correction" might have been made with some of the grade-level findings, but it will be recalled that most candidates for such corrections were rejected within the textual discussion.)

Figure 6-11 reveals considerable strength for grade-level, age-of-teacher, and subject matter differences. Only when sex-of-teacher is considered as an independent variable does the proportion of findings drop off -- and then only to the one-in-four level. It should also be noted that fewer findings were discovered between Grades I and XI than between either of these grades and Grade VI. In addition, for all independent variable classes there were slightly fewer findings that were significant for duration -- as opposed to incident frequency -- paralling a finding from Chapter V that classrooms were more variable in activity selection than in activity duration.

However, the overwhelming conclusion forced by Figure 6-11 is that classrooms are, indeed, different from one another, and that the independent variables selected for analysis truly make a difference in classroom activity format. If Figure 6-11 may be taken as evidence, we now also have excellent evidence of the validity of the instruments devised for activity measurement.

Figure 6-11. -- Numbers of Significant Differences by Independent and Dependent Variable Classes ($P<.05$)

Dependent Variable Classes	Grade						Age of Teacher		S-M		Sex of Teacher			
	I x VI		VI x XI		I x XI						Unconnected		Connected	
Function (N=12)	4*	4	6	5	5	4	2	3	3	4	6	4	2	2
Communication Structure (N=15)	8	8	10	8	8	6	8	7	11	5	9	8	9	6
Central Role Structure (N=5)	1	3	1	4	2	4	2	4	0	3	2	2	0	1
Central Role Allocation (N=46)	21	16	15	10	22	16	20	13	19	16	25	12	11	7
Teacher Role (N=10)	5	5	6	6	2	2	6	3	7	5	3	3	3	3
Emitter Location (N=26)	15	14	14	11	11	7	11	11	11	7	15	12	9	6
Target Location (N=32)	16	12	18	14	6	4	16	13	10	8	14	13	9	9
Audience Location (N=16)	2	1	0	1	1	0	2	2	0	1	1	1	0	1
Teacher Location (N=23)	7	10	10	11	9	6	8	14	6	10	13	9	8	8
(N=190)	79 42%	73 38%	80 42%	70 37%	66 35%	49 26%	75 39%	70 37%	67 35%	59 31%	88 46%	64 34%	51 27%	43 23%

*As was true for the other tables of the chapter, the first figure of each pair refers to number of incidents, the second to duration.

CHAPTER VII

COINCIDENTAL PROPERTIES OF CLASSROOM ACTIVITIES

The purpose of this, the third chapter concerned with the presentation of data, is to examine the problem of coincidence of classroom phenomena. Given the various ways in which classroom activities have been coded, which types of classroom events tend to go with what others?

The basic strategy for the present analysis makes use of two-dimensional matrices in which the dimensions consist of the component categories of two specified dependent variable classes. Each resultant cell contains a count of the number of instances of coincidence -- when the two cross-related categories existed together.

The source data for this analysis were 32 sets of sequentially ordered IBM cards that contained encodings of activities for each classroom. However, since coding rules specified that a new IBM card would be punched whenever *any* coded phenomenon changed, to do a coincidence analysis of classroom events on a card-by-card, or *episode*, basis would have resulted in inflating coincidence frequencies for those events which happened to persist while other phenomena were changing. For instance, let us assume that within a given classroom there occurs a coincidental event in which a *functional* state (e.g. intellectualization about sociation) is pared with a *communication system structure* state (e.g. central group only) while at the same time rapid changes are taking place in *location* states. To conduct a card-by-card analysis would result in falsely inflating the number of occurrences of intellectualization-about-sociation: central-group-only pairing. A more correct analysis technique, using *incidents*, is to define as the unit of analysis an event that persists as long as there is no change in *either of the two* variable fields being considered. This latter form of analysis has been performed, and frequencies reported are for incidents so defined.

For each two variable comparisons, fourteen separate arrays or matrices were assembled to yield coincidental information. The fourteen, separate "runs" were made in terms of the following independent variables:

All classrooms together
First grade classrooms
Sixth grade classrooms
Eleventh grade classrooms
Classrooms of female teachers
Classrooms of male teachers
Classrooms of female, sixth grade teachers
Mathematics classrooms
Social studies classrooms
Classrooms of younger teachers
Classrooms of older teachers
Classrooms of male, sixth grade teachers
Classrooms of female, eleventh grade teachers
Classrooms of male, eleventh grade teachers

Comparisons were also made among these various arrays to measure differences among the various independent variable treatment conditions. Comparisons were computed between:

First and sixth grade classrooms
Sixth and eleventh grade classrooms
First and eleventh grade classrooms
Male and female teachers
Male and female sixth grade teachers
Male and female eleventh grade teachers

Mathematics and social studies classrooms	Female sixth and eleventh grade teachers
Younger and older teachers	Male sixth and eleventh grade teachers

The statistic chosen to assess relationships among these data is _Lambda_, the index of predictive association (See Appendix D). Lambda estimates the proportions of errors in prediction that can b _eliminated_ by taking account of the knowledge of one classification of an individual in a cross-classification. For example, if one knws the category within a given variable that obtains for a given classroom event, how much better is one able to predict that a given catgory of a second variable will occur? Lambda actually gives a _percentag_ figure which estimates the gain of predictive accuracy for a matrix as a whole. Any given Lambda may be examined to see whether it is significantly different from zero. Any two Lambdas may be compared with one another for significance of their difference. Lambda is also relatively non-parametric; few assumptions are made regarding the underlying distributions of the two variables involved. Values range from .00 (indicating independence of the two variables involved) to 1.00 (indicating that one may predict with complete certainty from the first to the second).*

Three variations of Lambda have been used in reporting data in this memo. When examing the relationship between any two variables

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*In general terms a Lambda index may be regarded as equivalent to r^2. Consequently the square root of a Lambda provides rough parity with a correlation coefficient. Thus Lambda .069 approximates r=.26, Lambda .533 approximates r=.73 and Lambda .865 approximates r=.93.

(A and B), Lambda$_{A>B}$ is a measure of the predictive increase gained in B by knowing A. Lambda$_{B>A}$ is a measure of the predictive increase gained in A by knowing B. Finally, Lambda$_{A,B}$ is a measure of the predictive increase gained by knowing either A or B and predicting the other. Note that Lambda$_{A>B}$ need not equal Lambda$_{B>A}$. The reason for this is that one variable may give more definitive control than the other, with which it is compared. For example, functional categories might predict unequivocably to locational categories, but a given locational code might tell us only that the functional alternatives were reduced to two possibilities. Lambda$_{A,B}$ is a weighted average of both Lambda$_{A>B}$ and Lambda$_{B>A}$, and will be between them in value. In reporting the results of Lambda calculations, the Lambda value has been re-interpreted directly as a proportion of the error eliminated. Thus, for example, Lambda .231 would be listed as 23% error elimination. Several other conventions have also been used in presenting the report. Differences are termed "significant" if they were associated with a probability less than .01. In the percentage tables derived from Lambda calculations, percentages that are significantly different from zero (indicating that the null hypothesis of no association between the variables is rejected at $p <.01$) are denoted with an asterisk. When two Lambdas are compared, their difference is reported as a normal "z" score, and those "z" scores which are significant (at $p < .01$) are again indicated with an asterisk. Results are presented: (1) in matrix form for all classrooms taken together; (2) as a listing of Lambdas; (3) as "z" scores* for all types of classrooms and classroom comparisons, and (4) in textual discussion.* Unless otherwise identified, Lambdas cited in the text were computed from data for all classrooms.

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*Where no significance at all is revealed, the "z" score tables have been omitted.

Findings for Functional-Structural Dependent Variable Pairs

Unless otherwise stated the findings in this section were derived from the central group.

Function and Role Structure (Figures 7-1 and 7-2)

Figure 7-1 arrays the coincidental events defined by considering function and role structure jointly for all classrooms. Since by definition the existence of a central group function depends on the existence of a central group role structure and vice versa, categories referring to no central function (row 0) and no central group role structure (column 0) were omitted from the analysis to avoid spurious results. Figure 7-2 presents percentages derived from Lambda scores derived from this matrix and from matrices for groups of classrooms for this two-variable comparison.**

Note that function and role structure do not predict equally to one another. Knowing something about function permits the elimination of 4 percent of the errors in predicting role structure (Lambda = .044)

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*Since to have calculated Lambdas for all cells of the arrays would have resulted in some cases in artifactually inflating the values of many Lambda scores, some rows and columns have been dropped from matrices before calculation took place. For the most part these were the rows and columns representing codes of "0" or "99" indicating that no coding of the variable being considered was done because the communication group examined did not exist.

**Note in Figure 7-2 that only the top line of figures were calculated from data presented in Figure 7-1. The remaining figures in Figure 7-2 came from matrices similar to that found in Figure 7-1 but assembled from the groups to classrooms specified.

Figure 7-1. -- Coincidence of Function and Role Structure (Central Group) For All Classrooms

Structure	1	2	3	4	5	0	Total
Function							
11	0	90	69	5	7	0	171
12	0	0	0	0	(2)	0	2
13	0	2	3	2	1	0	8
14	0	0	0	0	0	0	0
21	(3)	(1342)	(1346)	(36)	0	0	2727
22	2	163	212	22	0	0	399
23	0	20	33	1	0	0	54
24	1	556	459	23	0	1	1040
31	0	437	512	2	0	0	951
32	0	4	9	0	0	0	13
33	0	2	4	0	0	0	6
34	0	25	23	0	0	0	48
99	0	7	25	2	0	0	34
0	0	1	2	0	0	334	337
TOT	6	2649	2697	93	10	335	5790

Legend

Structure:
1 = Audience Only
2 = Emitter + Audience
3 = Emitter + Target + Audience
4 = Emitter + Target
5 = Emitter, Only
0 = Non-Existent

Function:
11 operation - $S\text{-}M_1$
12 operation - $S\text{-}M_2$
13 operation - sociation
14 operation - organization
21 info dissem - $S\text{-}M_1$
22 info dissem - $S\text{-}M_2$
23 info dissem - sociation
24 info dissem - organization
31 intell - $S\text{-}M_1$
32 intell - $S\text{-}M_2$
33 intell - sociation
34 intell - organization
99 Indeterminate
0 No function

Figure 7-2. -- Coincidence: Percentage Error Elimination For Function and Role Structure (Central Group)

Independent Variables	Relationship		
	Fn.>R.S.	R.S.>Fn.	Fn.,R.S.
All Classrooms	4% *	0%	2%
1st Grade	8% *	0%	4%
6th Grade	0%	0%	0%
11th Grade	2%	0%	1%
Mathematics	7% *	0%	3%
Soc. Studies	4%	0%	2%
Younger Teachers	7% *	0%	4%
Older Teachers	3%	0%	2%
Female Teachers	5%	0%	3%
Male Teachers	4%	0%	2%
Male 6th Grade	0%	0%	0%
Female 6th Grade	2%	4%	3%
Male 11th Grade	0%	0%	0%
Female 11th Grade	7%	0%	4%

Note: * denotes significance at .01 or better.

but knowing something about role structure does not permit the elimination of any error in predicting function. (Lambda = .003). The former figure is significant, the latter is not. The ability to predict role structure from function results from the significant Lambdas of first grade classes, mathematics classes, and younger teachers classes.

Explanations of these results is implied by the figures in parentheses in Figure 7-1. In the table the figures on which interpretations have been based have been either underlined or put in parentheses. The underlined figures refer to high scores in each row, (for predictions made from the first variable to the second). The figures in parentheses refer to the high score in each column (for predictions made from the second variable to the first). This convention is followed throughout the memo.

It is noteworthy that all role structures (excepting the unlikely emitter only structure, (code number 5)) predict to the same function, viz., information dissemination about relevant subject matter (code number 21). Thus, we would predict code #21 as most likely whether or not we know the existing central group role structure. However, knowing which function exists allows some differential prediction of role structure. Consider the underlined figures. If the functional content is operation on relevant subject matter (code #11), or information dissemination about organization (code #24 or intellectualization about organization (code #34), a role structure consisting of emitter and audience (code #2) is most likely. If other functions exist, a three role structure consisting of emitter, target, and audience (code #3) is most likely, except when there is the (infrequent) concurrence of emitter only, (code #5), with operation with non-relevant subject matter, (code #12).

It is noteworthy that the frequencies of emitter-audience structure (code #2) and of emitter-target-audience (code #3) are relatively similar for each functional category.

No significant differences are generated for function-role structure relationships when independent variable comparisons are made among classrooms.

Function and Role Allocation (Figures 7-3 and 7-4)

Figure 7-3 arrays the coincidental events defined by considering function and role allocation for all classrooms. Since by definition function cannot exist without roles and vice versa, categories referring to no central function (column 0) and no roles allocated (row 0) were omitted from the analysis in order to avoid spurious results. Figure 7-4 presents error elimination percentages derived from this matrix together with others derived from similar matrices for sub-groups of classrooms.

It is apparent that function and role allocation do not predict equally to one another. Knowledge of function does not permit the elimination of a significant proportion of error in predicting role allocation (Lambda Function>Role Allocation .003). No significant differences exist among the sub-groups of classrooms. However, Figure 7-3 does reveal that most types of function tend to be associated with the teacher-emitter, pupil quorum audience (code #104).

Figure 7-3. -- Coincidence of Function and Role Allocation (Central Group) For All Classrooms

Function Allocation	11	12	13	14	21	22	23	24	31	32	33	34	99	(0)	Total
101	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
103	8	0	0	0	109	16	1	52	4	0	0	2	0	0	192
104	(94)	0	(2)	0	(1128)	(139)	(19)	(498)	(384)	(4)	2	(23)	4	1	2298
107	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
113	0	0	0	0	0	2	0	1	0	0	0	0	0	0	3
114	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
120	0	0	0	0	7	7	1	10	2	0	0	0	0	0	27
122	0	0	0	0	4	1	1	0	0	0	0	0	0	0	6
123	5	0	0	0	48	19	6	57	3	1	0	1	1	1	142
124	29	0	1	0	470	65	12	230	239	3	(3)	18	3	0	1073
130	0	0	0	0	1	1	0	2	0	0	0	0	0	0	4
133	0	0	1	0	4	2	1	19	0	0	0	1	0	0	28
134	1	0	0	0	7	2	2	20	1	0	0	0	0	0	33
140	4	0	0	0	2	0	0	4	0	0	0	0	0	0	10
143	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
203	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
204	1	0	0	0	11	2	0	1	2	0	0	0	1	0	18
207	18	0	0	0	128	10	0	16	49	0	0	0	1	0	222
210	0	0	1	0	13	11	0	6	0	0	0	0	2	0	33
212	0	0	0	0	10	5	0	1	0	0	0	0	1	0	17
213	1	0	0	0	74	39	4	26	7	0	0	2	6	0	159
214	24	0	0	0	770	101	5	142	296	3	2	7	(12)	1	1368
217	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
224	0	0	0	0	12	1	0	4	4	0	0	0	0	0	21
226	0	0	0	0	1	0	0	1	1	0	0	0	0	0	3
227	2	0	0	0	53	2	0	12	24	1	0	0	0	0	94
241	1	0	0	0	0	0	0	5	0	0	0	0	0	0	6
253	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
254	0	0	0	0	3	1	0	0	1	0	0	0	0	0	5
304	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
306	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
307	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
313	4	0	1	0	114	12	0	21	8	0	0	0	1	0	161
314	9	0	0	0	63	10	1	17	30	2	0	1	0	0	133
324	0	0	0	0	1	0	0	0	3	0	0	0	0	0	4
326	0	0	0	0	0	0	0	1	2	0	0	0	2	0	5
327	0	0	0	0	6	1	0	1	4	0	0	0	0	0	12
353	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
410	1	0	1	0	14	0	0	2	0	0	0	0	0	0	18
413	3	0	1	0	4	0	1	0	1	0	0	0	0	0	10
504	5	0	0	0	1	0	0	0	0	0	0	0	0	0	6
603	14	0	0	0	6	0	0	1	0	0	0	0	1	0	22
604	11	0	0	0	1	0	0	0	0	0	0	0	0	0	12
700	7	(2)	1	0	0	0	0	0	0	0	0	0	0	0	10
703	9	0	0	0	0	0	0	0	0	0	0	0	0	0	9
(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	334	334
TOTAL	251	2	9	(0)	3078	454	54	1139	1066	14	7	39	35	337	6521

Legend: Function - See Figure 7-1
Role Allocation - The role figures of the code represent respectively Emitter, Target and Audience. The code numbering is as follows: 1 = Target, 2 = Singl Student, 3 = Segment, 4 = Quorum, 5 = T + 1 Student, 6 = T + segment, 7 = T + Quorum.

Knowledge of role allocation is somewhat more helpful in predicting to function. Although the Lambda for all classrooms is not significant (Lambda Role Allocation>Function = .032), Figure 7-4 shows that in classes of, (i) grade 1 (ii) social studies, (iii)younger teachers, and (iv) female teachers (both the 6th and 11th grade level), when something is known about the roles allocated, a significant proportion of error in predicting central group function may be eliminated.

All of the classroom sub-groups show that when the existing role allocation is: pupil-emitter; teacher-target; and pupil quorum-audience (code #214), information dissemination about relevant subject matter (code #21) is most likely. All of the classrooms show a high frequency of occurrence for this combination. Some other patterns of role allocation also frequently coexist with information dissemination about relevant subject matter (#21) for all these sets of classrooms, viz: (i) pupil emitter, no target, teacher plus quorum-audience (207), (ii) pupil-emitter, pupil-target, pupil quorum plus teacher-audience (code #227), (iii) pupil segment-emitter, teacher target, pupil segment-audience (code #313), (iv) pupil segment-emitter, teacher target, pupil segment-audience (code #314) and (v) pupil-emitter, teacher and pupil quorum-audience (code #313). The often used pattern of teacher-emitter, pupil-target, pupil quorum-audience (code #124) also coexists most frequently with relevant subject matter (21), but not for all of these classroom sets. The exceptions are (i) classes of 6th grade female teachers, where this pattern of role allocation (124) coexists most frequently with information dissemination about organization (code #24); and (ii) in classes of 11th

Figure 7-4. -- Coincidence of Function and Group Role Allocation (Control Group)

Independent Variables	Relationship		
	Fn.>RA	RA>Fn.	Fn.R.A.
All Classrooms	0%	3%	2%
1st Grade	2%	7%*	4%
6th Grade	1%	3%	2%
11th Grade	0%	3%	2%
Mathematics	0%	3%	1%
Soc. Studies	0%	5%*	2%
Younger Teachers	0%	6%*	3%
Older Teachers	0%	2%	1%
Female Teachers	1%	5%*	3%
Male Teachers	0%	2%	1%
Male 6th Grade	1%	4%	2%
Female 6th Grade	3%	12%*	7%
Male 11th Grade	0%	3%	1%
Female 11th Grade	3%	15%*	8%

Note: * denotes significance at .01 or better.

grade female teachers, where pattern (124) coexists most frequently with intellectualization about relevant subject matter (code #31). Again the often used pattern of teacher-emitter, pupil quorum (code #104) coexists most frequently with information or dissemination about relevant subject matter (21) except in 6th grade female teachers' classes where it most often coexists with information about organization (24).

For these same classroom sub-groups also, information about organization (22) is most likely to occur jointly with teacher-emitter, pupil-target, and pupil segment audience (code #123) and teacher-emitter, pupil segment audience (code #103). There is one exception. In 6th grade classes, information dissemination about relevant subject matter (21) is more likely to coexist with teacher-emitter, pupil segment-audience (103).

Some further information is more specific to particular sets of classrooms. For first grade teachers only, patterns of role allocation which include the teacher plus one or more pupils as emitters (codes #504, 603, 604, 700, 703) tend to coexist with relevant subject matter functions (code #11). These coinciding phenomena also occur more often among the younger first grade teachers teaching social studies. Sixth and 11th grade female teachers show none of these patterns. Sixth grade female teachers' classes, however, show a greater frequency of association between information dissemination about relevant subject matter and both pupil-emitter, pupil target, and teacher plus quorum audience (227) and pupil-emitter, teacher plus quorum audience (207) about relevant subject matter (21). Classes of

11th grade female teachers indicate association between pupil-emitter, teacher-target and pupil segment-audience (code #213) and information dissemination about non-relevant subject matter (22).

No significant differences are generated for function-role allocation relationships when independent variable comparisons are made among classrooms.

Function and Emitter Location

Knowledge of function does not permit the elimination of a significant proportion of errors in predicting the location of the emitter (Lambda Function>Emitter Location = .000). Neither does knowledge of the emitter's location enable the elimination of a significant proportion of errors in predicting the function of the central group (Lambda Emitter Location>Function = .003). No sets of classrooms yield significant Lambdas. All comparisons between sets of classrooms are non-significant.

Function and Target Location

Knowledge of central group function does not permit the elimination of a significant proportion of errors in predicting location of central group target (Lambda Function > Target Location = .002). Similarly, knowledge of the location of the central group target does not permit the elimination of a significant proportion of errors in predicting central group function (Lambda Target Location>Function = .016). No sets of classrooms produce significant Lambdas. All comparisons between sets of classrooms are non-significant.

Function and Audience Location

Knowledge of central group function does not permit the elimination of a significant proportion of error in predicting location of central group audience (Lambda Function>Audience Location = .000). Again, knowledge of central group audience location does not permit the elimination of significant proportion of error in predicting central group function (Lambda Audience Location>Function = .007). No sets of classrooms produce significant Lambdas. All comparisons between sets of classrooms are non-significant.

Function and Teacher Role Assignment

Figure 7-5 arrays the coincidental events defined by considering function and teacher role assignment for all classrooms. Figure 7-6 presents percentages of error elimination derived for Lambda scores and Figure 7-7 presents z scores derived from this matrix and from matrices for sub-groups of classrooms.

Central group function and teacher role assignment do not predict equally to one another. Knowing something about central group function permits the elimination of 15 percent of the error in predicting to teacher role assignment (Lambda Function>Role Assignment = .147), but knowing something about teacher role assignment permits the elimination of 22 percent of the errors in predicting central group function (Lambda Role Assignment>Function = .223). Both of these results are significant.

An explanation of these results may be obtained from a consideration of the underlined figures. In predicting teacher role assignment from two functional categories, notice that only "indeterminate" function (code #99) and no function (code #0) enable differential prediction. If central function is indeterminate (99), it is most likely that the teacher is target of the central group (code #2). If no

Figure 7-5.-- Coincidence of Function and Teacher Role Assignment For All Classrooms (Central Group)

Teacher Role Assignment Function	1	2	3	4	5	6	7	8	9	0	TOTAL
11	84	39	18	1	0	0	0	0	0	0	142
12	2	0	0	0	0	0	0	0	0	0	2
13	5	3	0	0	0	0	0	0	0	0	8
14	0	0	0	0	0	0	0	0	0	0	0
21	(1319)	(989)	(183)	20	6	3	0	0	0	17	2537
22	209	156	14	1	0	0	0	0	0	4	384
23	19	11	0	0	0	0	0	0	0	0	30
24	220	202	32	1	0	0	0	0	0	7	462
31	458	324	65	3	0	0	0	0	0	6	856
32	8	5	1	0	0	0	0	0	0	0	14
33	5	2	0	0	0	0	0	0	0	0	7
34	37	10	0	0	0	0	0	0	0	0	47
99	9	19	3	0	1	0	0	0	0	0	32
(0)	2	1	0	(134)	(154)	(15)	(1)	0	(1)	(423)	732
TOTAL	2377	1761	316	210	161	18	1	0	1	457	5323

Legend: Function - See Figure 7-1
Teacher Role Assignment - 1 = Emitter in Central group
2 = Target in Central group
3 = Audience in Central group
4 = Emitter in Peripheral group[1]
5 = Target in Peripheral group[1]
6 = Audience in Peripheral group[1]
7 = Emitter in Peripheral group[2]
8 = Target in Peripheral group[2]
9 = Audience in Peripheral group[2]
0 = Non-involved or out of room

Figure 7-6. -- Coincidence: Percentage Error Elimination for Function and Teacher Role Assignment (Control Group)

Independent Variables	Relationship		
	Fn.>TRA	TRA>Fn.	Fn.,TRA
All Classrooms	13% *	22% *	19%
1st Grade	17% *	20% *	19%
6th Grade	12% *	27% *	20%
11th Grade	16% *	20% *	18%
Mathematics	18% *	29% *	24%
Social Studies	11% *	13% *	12%
Younger Teachers	16% *	37% *	28%
Older Teachers	13% *	15% *	14%
Female Teachers	14% *	26% *	21%
Male Teachers	13% *	17% *	16%
Male 6th Grade	13% *	13% *	13%
Female 6th Grade	17% *	42% *	31%
Male 11th Grade	17% *	21% *	19%
Female 11th Grade	15% *	18% *	16%

Note: * denotes significance at .01 or better.

Figure 7-7. -- Independent Variable Coincidence Comparisons: Function and Teacher Role Assignment (Control Group)

Independent Variables	z Scores	
	Fn.-T.R.A.	T.R.A.-Fn.
1st vs. 6th	1.43	-2.33
6th vs. 11th	-1.48	2.59 *
11th vs. 1st	0.17	0.04
Math vs. S.S.	2.70 *	6.96 *
-30 vs. +40	1.13	3.23 *
F vs. M	-0.43	4.13 *
M6th vs. 11th	-0.72	-2.03
F 6th vs. 11th	0.38	4.52 *
6th M vs. F	-1.06	-7.22 *
11th M vs. F	0.47	0.36

Note: * denotes significance at .01 or better.

central function exists (0 row), then the teacher is most likely to be non-involved (code #0 column). Any other function category predicts to the teacher's assignment as emitter in the central group (code #1). Mathematics classes are significantly more predictable than social studies classes in these respects.

In predicting function from knowledge of teacher role assignment, it is noteworthy that if the teacher is a member of a peripheral group (code #3, 4, 5, 6, 7, 9) or non-involved (code #0 column), central group function is likely to be nonexistent. If the teacher is a member of the central group (code #5, 1, 2, 3) information dissemination about relevant subject matter is most likely (code #21).

Differences in strength of function-TRA relationships among classroom sub-groups also exist (See Figure 7-7). These relationships are more pronounced for sixth grade classes than for eleventh grade classes, for mathematics than for social studies classes, for younger teachers than for older teachers, for sixth grade than eleventh grade female teachers, and for sixth grade female teachers than for sixth grade male teachers.

It is apparent that success in predicting either teacher role assignment or function is due in large measure to the strength of coexistence of certain specific categories -- the coexistence of no central function (0 row) with either the teacher non-involvement (0 column) or teacher involvement in peripheral groups (4, 5, 6, 7, 9). However, it is of interest to consider the relationship of teacher role assignment to the central group when it is actively functioning. Figure 7-8 presents percentages derived from Lambda scores for function and

Figure 7-8. -- Coincidence: Revised Percentage Error Elimination For Function and Teacher Role Assignment (Control Group) For All Classrooms

Independent Variables	Relationship		
	Fn.>TRA.	TRA.>Fn.	Fn.,TRA.
All Classrooms	0%	0%	0%
1st Grade	1%	0%	0%
6th Grade	0%	0%	0%
11th Grade	0%	1%	0%
Mathematics	0%	0%	0%
Soc. Studies	0%	0%	0%
Younger Teachers	1%	0%	0%
Older Teachers	0%	0%	0%
Female Teachers	0%	0%	0%
Male Teachers	0%	0%	0%
Male 6th Grade	0%	0%	0%
Female 6th Grade	0%	9% *	3%
Male 11th Grade	0%	2%	1%
Female 11th Grade	1%	1%	1%

Note: * denotes significance at .01 or better.

teacher role assignment, when the situation is redefined to include only the set of events in which the central group is actively functioning. Little residual predictability is shown. For all classrooms taken together, the proportion of errors eliminated by knowing something about central group function when predicting teacher role assignment is reduced to non-significance (revised Lambda Function-Role Assignment = .004). No significant differences exist between classroom sub-groups.

However, for classrooms of female sixth grade teachers, knowledge of teacher role assignment enables one to eliminate 9 percent of the errors in predicting function. This result is significant. Figure 7-9 arrays the instances of coincidence for central group function and teacher role assignment for classes of sixth grade female teachers. From a consideration of the underlined numbers it is apparent that if the teacher is: (i) the central target (code #2), (ii) a member of the central group audience (code #3), (iii) an emitter of the peripheral group (code #4), or (iv) non-involved (code #0), then central function is most likely to consist of information about relevant subject matter. But if the teacher is the central emitter, information about organization (code #24) is more likely.

Function and Teacher Location

Figure 7-10 arrays the coincidental events defined by considering function and teacher location jointly for all classrooms. Figure 7-11 represents percentages derived for Lambda scores, and Figure 7-12 presents z scores derived from this matrix and from matrices for subgroups of classrooms.

Figure 7-9 -- Coincidence of Function and Role Assignment For Sixth Grade Female Teachers

Teacher Role Assignment	1	2	3	4	5	6	7	8	9	0	TOTAL
Function											
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
21	121	(70)	(66)	(5)	0	0	0	0	0	(9)	271
22	13	7	1	0	0	0	0	0	0	0	21
23	2	0	0	0	0	0	0	0	0	0	2
24	(159)	44	24	1	0	0	0	0	0	6	234
31	66	43	21	3	0	0	0	0	0	0	137
32	1	1	0	0	0	0	0	0	0	0	2
33	2	1	0	0	0	0	0	0	0	0	4
34	27	8	0	0	0	0	0	0	0	0	35
99	2	0	2	0	0	0	0	0	0	0	4
(0)	0	0	0	108	90	12	0	0	0	71	281
TOTAL	393	19[illegible]	114	117	90	12	0	0	0	86	1011

Legend: Function - see Figure 7-1.
Teacher Role Assignment - 1 = Emitter in Central group
2 = Target in Central group
3 = Audience in Central group
4 = Emitter in Peripheral group[1]
5 = Target in Peripheral group[1]
6 = Audience in Peripheral group[1]
7 = Emitter in Peripheral group[2]
8 = Target in Peripheral group[2]
9 = Audience in Peripheral group[2]
0 = Non-involved or out of room

Function and teacher location predict to each other about equally well. With some information available about function it is possible to eliminate 11 percent of error in predicting teacher location (Lambda Function>Teacher Location = .111). With some information about teacher location available, it is possible to eliminate 9 percent of error in predicting to central group function (Lambda Teacher Location>Function = .090).

The underlined figures in Figure 7-10 provide the explanation of these results. If function exists (all codes), the teacher is most likely to be located in the center front in the classroom (code #24 column). If no codeable function exists (code #0 row) then the teacher's location is most likely to be diffuse (code #11 column). No significant differences are generated by comparison of groups of classes.

From the figures in parentheses in Figure 7-10 it follows that if teacher location is diffuse (code #11 column), central group function tends not to exist (code #0 row). If the teacher is located in the left aisle near the front (code #35), in the rear row center or left (code #54, 55), or in the rear aisle center, left, or left side (code #64, 65, 66), information dissemination about organization (code #24) is most likely. If the teacher has no location in the room (code 0 column), it is most likely that no central function exists. As Figure 7-12 indicates, these tendencies are stronger for: first and eleventh grade teachers than sixth grade teachers; for mathematics than for social studies; for younger teachers than for older teachers; for eleventh

Figure 7-10. -- Coincidence of Function and Teacher Location (Central Group) For All Classrooms

Location Function	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
11	52	0	0	0	0	0	0	0	5	40	13	0	0	2	3
12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	6	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	181	0	0	0	0	0	(3)	(4)	(61)	(332)	(136)	(7)	0	(34)	(21)
22	18	0	0	0	0	0	0	1	15	188	13	3	0	3	4
23	0	0	0	0	0	0	0	0	6	27	0	0	0	2	2
24	33	0	0	0	0	0	0	3	27	467	71	4	0	20	11
31	66	0	0	0	0	0	0	0	23	329	56	8	0	14	6
32	1	0	0	0	0	0	0	0	0	8	1	0	0	0	0
33	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0
34	0	0	0	0	0	0	0	0	0	18	3	0	0	1	1
99	4	0	0	0	0	0	0	0	0	15	2	2	0	0	0
0	(378)	0	0	0	0	0	0	0	1	79	13	4	0	2	12
TOTAL	736	0	0	0	0	0	3	8	138	2019	309	28	0	78	60

Location Function	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
11	19	1	0	0	1	2	20	1	7	0	0	0	7	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	(96)	9	(59)	0	(20)	(24)	(58)	(24)	(22)	0	(19)	(6)	48	(7)	(9)
22	26	6	4	0	3	5	15	11	0	0	2	1	11	1	2
23	4	1	0	0	1	1	2	2	0	0	0	1	0	1	0
24	88	(14)	34	0	10	16	55	15	10	0	11	1	(32)	(7)	7
31	21	7	40	0	7	4	10	11	18	0	3	0	41	4	3
32	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
33	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1
34	9	0	3	0	2	2	2	0	1	0	1	0	3	0	1
99	2	0	1	0	0	0	0	0	0	0	1	0	2	1	0
0	48	4	3	0	1	7	18	8	2	0	0	4	23	9	5
TOTAL	314	42	146	0	45	61	180	72	60	0	37	13	139	31	28

(Continued on next page)

Legend: Function - See Figure 7-1.
Location - A Location score is constructed by combining two categories, one each from the vertical and horizontal dimensions, respectively.

(Vertical Dimension)	(Horizontal Dimension)
1 = Diffuse (General)	1 = Diffuse (General)
2 = Front	2 = Right
3 = Forward	3 = Right centre
4 = Middle	4 = Centre
5 = Rearward	5 = Left centre
6 = Rear	6 = Left

Figure 7-10.(Continued)

Location	61	62	63	64	65	66	99	0	TOT
Function									
11				1				1	183
12									2
13									7
14									
21			3	2	1			24	(1710)
22			1	5	3	1		7	348
23				1					51
24			1	5	4	2		14	982
31				1				8	680
32									13
33									7
34								1	48
99									31
0				6	6			(79)	712
TOT			4	21	15	3		134	4774

Figure 7-11. -- Coincidence: Percentage Error Elimination for Function and Teacher Location (Central Group)

Independent Variables	Relationship		
	Fn.>T.L.	T.L.>Fn.	Fn., T.L.
All Classrooms	11% *	9% *	10%
1st Grade	14% *	14% *	14%
6th Grade	9% *	6% *	8%
11th Grade	11% *	14% *	13%
Mathematics	12% *	15% *	14%
Social Studies	10% *	2%	6%
Younger Teachers	12% *	13% *	12%
Older Teachers	11% *	6% *	8%
Female Teachers	12% *	11% *	11%
Male Teachers	10% *	11% *	10%
Male 6th Grade	12% *	9% *	11%
Female 6th Grade	9% *	10% *	9%
Male 11th Grade	9% *	13% *	12%
Female 11th Grade	22% *	28% *	26%

Note: * denotes significance at .01 or better.

Figure 7-12. -- Independent Variable Coincidence Comparisons: Function and Teacher Location (Central Group)

Independent Variables	z Scores	
	Fn.>T.L.	T.L.>Fn.
1st vs. 6th	1.62	3.07 *
6th vs. 11th	-0.64	-3.16 *
1st vs. 11th	0.84	-0.00
Math vs. S.S.	0.90	5.64 *
-30 vs. +40	0.39	3.13 *
F vs. M	1.09	-0.19
M 6th vs. 11th	0.66	-1.07
F 6th vs. 11th	-2.00	-3.99 *
6th M vs. F	0.87	-0.28
11th M vs. F	-1.88	-3.36 *

Figure 7-13. -- Coincidence: Revised Percentage Error Elimination for Function and Teacher Location (Control Group)

Independent Variables	Relationship		
	Fn.>T.L.	T.L.>Fn.	Fn., T.L.
All Classrooms	0%	1%	1%
1st Grade	1%	9%*	5%
6th Grade	0%	1%	1%
11th Grade	0%	4%	2%
Mathematics	0%	2%	1%
Social Studies	1%	1%	1%
Younger Teachers	1%	1%	1%
Older Teachers	0%	2%	1%
Female Teachers	1%	5%*	3%
Male Teachers	0%	1%	0%
Male 6th Grade	2%	1%	1%
Female 6th Grade	0%	7%	4%
Male 11th Grade	0%	4%	2%
Female 11th Grade	1%	17% *	12%

Note: * denotes significance at .01 or better.

grade female than sixth grade female teachers; and for eleventh grade female teachers' than 11th grade male teachers' classes.

If the situation is redefined to include only the set of events in which the central group is actively functioning and the teacher does have a location in the room, little residual predictability remains. Figure 7-13 presents the relevant calculations. Under these new circumstances, the ability to predict teacher location by knowing something about central group function disappears (revised Lambda Function Teacher Location = .002). No significant differences remain between groups of classrooms. These findings imply that the original predictability was produced almost entirely by the coexistence of no codeable central function (0 row) with diffuse teacher location (11 column). For all classrooms, the ability to predict function by knowing something about teacher location also disappears (revised Lambda Teacher Location Function = .000). No significant differences among groups of classrooms remain, with the exception that for first grade, female teachers', and eleventh grade classrooms with female teachers there is a residual pattern of predictability. Therefore, knowing something about teacher location allows one to eliminate respectively 9, 5, and 17 percent of the error in predicting central group function. This result is significant. Figure 7-14 arrays the coincidental events defined by considering function and teacher location for eleventh grade female teachers. The table shows that if teacher location is: (i) diffuse (code #11 column), (ii) along the front aisle (code #21 column), or (iii) center front (code #24 column) then information dissemination about relevant subject matter (code #21 row) is most likely. If the teacher location is: (i) center (code #44), (ii) rear right (code #53), (iii) rear left (code #55), or (iv) rear left aisle (code 56), then

Figure 7-14. -- Coincidence of Function and Teacher Location For Eleventh Grade Female Teachers (Central Group)

Location	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
Function															
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	(2)	0	0	0	0	0	(1)	0	0	(79)	(4)	(2)	0	0	0
22	1	0	0	0	0	0	0	0	0	25	1	0	0	0	(1)
23	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
24	0	0	0	0	0	0	0	0	1	32	1	0	0	0	0
31	1	0	0	0	0	0	0	0	(4)	57	(4)	(2)	0	0	0
32	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0
(0)	32	0	0	0	0	0	0	0	0	3	0	0	0	0	0
TOTAL	36	0	0	0	0	0	1	0	5	203	10	5	0	0	1

Location	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
Function															
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	1	0	1	0	0	0	1	0	0	0	0	0	1	1	0
22	(8)	(3)	0	0	0	(1)	5	(1)	0	0	0	0	(5)	0	0
23	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	(8)	1	0	0	0	(1)	(8)	0	0	0	0	(1)	2	(2)	(1)
31	0	1	(1)	0	0	0	0	0	0	0	0	0	1	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0
(0)	1	1	0	0	0	1	0	1	0	0	0	0	2	1	0
TOTAL	20	6	2	0	0	3	14	2	0	0	0	1	13	5	1

(Continued on next page)

Legend: Function - See Figure 7-1

Location - A Location score is constructed by combining two categories, one each from the vertical and horizontal dimensions, respectively.

(Vertical Dimension)	(Horizontal Dimension)
1 = Diffuse (General)	1 = Diffuse (General)
2 = Front	2 = Right
3 = Forward	3 = Right Centre
4 = Middle	4 = Centre
5 = Rearward	5 = Left centre
6 = Rear	6 = Left

Figure 7-14. (Continued)

Location	61	62	63	64	65	66	99	(0)	TOT
Function									
11									
12									
13									1
14									
21									93
22				(2)				3	56
23									4
24									58
31								1	72
32									1
33									1
34									
99									6
0								6	48
TOT				2				10	340

information dissemination about organization (code #24 row) is most likely. If teacher location is: (i) forward right, (ii) center, (iii) left, (code #33, 34, 35), (iv) middle left (code #45), (v) rear, or (vi) back center (code #54, 64), then information dissemination about non-relevant subject matter (code #24 row) is most likely. If teacher location is: (i) front right side, (code #22 column), or (ii) forward left aisle (code #36), intellectualization about relevant subject matter (code #31 row) is most likely. Teacher location front left (code #25) and left aisle (code #26) predict equally to intellectualization about relevant subject matter (31) and information dissemination about relevant subject matter (21). Teacher location forward center (code #34 column) predicts equally to information dissemination about non-relevant subject matter (22) and classroom management (24). In summary, for eleventh grade female teachers, teacher location in the front of the room is associated with either information dissemination or intellectualization about relevant material, and teacher location among the student desks (large center portion) is associated with information dissemination about either non-relevant material or classroom management.

Function and Non-involved Role Allocation

Figure 7-15 arrays the coincidental events defined by considering central group function and identity of non-involved actors jointly for all classrooms. Figure 7-16 presents error elimination percentages derived from Lambda scores, from the matrix of Figure 7-15 and from matrices for sub-groups of classrooms.

Knowledge about central group function does not permit the elimination of any error in predicting non-involved actors for classrooms

Figure 7-15. -- Coincidence of Function and Non-involved Role Allocation (Central Group) For All Classrooms

NIA	1	2	3	5	6	0	TOTAL
Function							
11	0	7	17	0	0	42	66
12	0	0	0	0	0	2	2
13	0	0	1	0	0	6	7
14	0	0	0	0	0	0	0
21	(3)	(27)	(145)	(2)	0	(777)	954
22	1	16	50	1	0	194	262
23	0	1	8	0	0	37	46
24	0	13	123	0	0	562	698
31	3	9	20	0	0	411	443
32	0	0	0	0	0	10	10
33	0	1	0	0	0	5	6
34	0	0	5	0	0	32	37
99	0	0	3	0	0	26	29
(0)	1	0	52	1	(47)	81	172
TOTAL	8	74	424	4	47	2185	2742

Legend: Function - See Figure 7-1
Noninvolved Actor (NIA) - 1 = Teacher
2 = One pupil
3 = Segment
5 = Teacher plus one pupil
6 = Teacher plus segment
0 = Missing data

Figure 7-16. -- Coincidence: Percentage Error Elimination For Function and Non-involved Role Allocation (Central Group)

Independent Variables	Relationship		
	Fn.>N.I.	N.I.>Fn.	Fn.,N.I.
All Classrooms	0%	3%	2%
1st Grade	0%	3%	2%
6th Grade	0%	4%	3%
11th Grade	0%	4%	3%
Mathematics	0%	5% *	4%
Social Studies	0%	2%	2%
Younger Teachers	0%	4%	3%
Older Teachers	0%	4%	3%
Female Teachers	0%	2%	1%
Male Teachers	2%	4%	3%
Male 6th Grade	20%	5% *	12%
Female 6th Grade	0%	10% *	0%
Male 11th Grade	0%	4%	4%
Female 11th Grade	0%	6%	5%

Note: *denotes significance at .01 or better.

taken together (Lambda Function>Non-involved Actors = .000). Knowledge about non-involved actors permits the elimination on only 3 percent of error in predicting central group function.

The underlined figures in Figure 7-15 show that if the central group is actively functioning (codes 11 through 99), it is most likely that no non-involved actors exist (column0).

The figures in parentheses in Figure 7-15 show that if the teacher plus a pupil segment (code #6) are non-involved, the central group tends not to be actively functioning. If only one or two individuals, be they teachers and/or pupils, are non-involved (codes #1, 2, 3, 5), function is most likely to comprise information dissemination about relevant subject matter (code #21).

Re-defining the situation, to include only those events during which non-involved actors _do_ exist and the central group _is_ actively functioning, yields results that one reported in Figure 7-17. This latter table again yields no significant general predictability from function to non-involved role allocation but surprisingly yields a percentage error elimination of 12 percent in the other direction. No significant differences between groups of classes appears for either data from Figure 7-16 or 7-17, but Figure 7-17 does reveal statistical significance in predicting function from non-involved role allocation for: sixth grade; mathematics teachers, younger teachers; older teachers, male teachers and female sixth grade classrooms.

To summarize, an actively functioning central group and more than two non-involved actors are generally mutually exclusive.

Figure 7-17. -- Coincidence: Revised Percentage Error Elimination For Function and Non-involved Role Allocation (Control Group)

Independent Variables	Relationship		
	Fn.>N.I.	N.I.>Fn.	Fn.,N.I.
All Classrooms	1%	12% *	9%
1st Grade	4%	9%	7%
6th Grade	2%	14% *	11%
11th Grade	4%	10%	8%
Mathematics	0%	17% *	13%
Social Studies	4%	10%	8%
Younger Teachers	8%	16% *	13%
Older Teachers	26%	13% *	19%
Female	5%	9%	8%
Male	23%	16% *	18%
Male 6th Grade	55% *	11%	17%
Female 6th Grade	50% *	41% *	46%
Male 11th Grade	0%	13%	7%
Female 11th Grade	25%	10%	14%

Note: * Denotes significance at .01 or better.

Function and Non-involved Actor Location

Figure 7-18 arrays the coincidental events defined by considering central group function and non-involved actor location jointly for all classrooms. Figure 7-19 presents error percentages derived from Lambda scores and Figure 7-20 presents z scores derived from this matrix and from matrices for sub-groups of classrooms for these two variable comparisons.

Function predicts more strongly to non-involved actor location (Lambda Function>Non-involved actor location = .283) than non-involved actor location predicts to function (Lambda Non-involved Actor Location > Function = .087). Both relationships are statistically significant, however.

It turns out that the ability to predict from function to non-involved actor location is the result of only one factor: Non-involved actors and a central group do not tend to coexist. Evidence of this relationship is shown in Figure 7-18 as the large concentration of events in row 0 (no codeable central function), column 11 (diffusely located non-involved actors), and in column 0 (no non-involved actors). In Figure 7-20 we find that these relationships are significantly stronger for: eleventh grade classes than sixth grade classes, for eleventh grade classes than for first grade classes, for younger teachers than for older teachers, and for male eleventh grade teachers than for male sixth grade teachers.

The ability to predict central group function from non-involved actor location is also primarily due to the tendency mentioned above, i.e., that non-involved actors and an actively functioning central group

Figure 7-18. -- Coincidence of Function and Non-involved Actor Location (Central Group) For All Classrooms

Location Function	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
11	18	0	0	0	0	0	0	(1)	0	0	0	0	0	2	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	(156)	(1)	0	0	0	0	0	0	0	0	(1)	0	0	0	(1)
22	58	0	0	0	0	0	0	0	0	1	(1)	(2)	0	0	0
23	10	0	0	0	0	0	0	0	0	0	0	0	0	0	(1)
24	137	0	0	0	0	0	0	0	0	1	0	0	0	0	1
31	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(0)	315	0	0	0	0	0	0	0	0	(2)	0	0	0	0	0
TOTAL	726	1	0	0	0	0	0	1	0	4	2	2	0	2	3

Location Function	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
11	1	0	0	0	(2)	2	4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	2	1	0	0	0	(3)	(13)	(3)	(1)	0	0	5	(4)	0	(1)
22	(3)	(2)	0	0	0	0	6	0	0	0	0	3	1	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	2	2	2	0	0	0	2	1	(4)	0
31	0	0	0	0	0	0	2	0	0	0	0	(7)	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	3	0	0	2	7	27	5	1	0	0	18	6	4	1

(Continued on next page)

Legend: Function - See Figure 7-1

Location - A Location score is constructed by combining two categories, one each from the vertical and horizontal dimensions, respectively.

(Vertical Dimension)	(Horizontal Dimension)
1 = Diffuse (General)	1 = Diffuse (General)
2 = Front	2 = Right
3 = Forward	3 = Right Centre
4 = Middle	4 = Centre
5 = Rearward	5 = Left centre
6 = Rear	6 = Left

Figure 7-18. (Continued)

Location	61	62	63	64	65	66	99	(0)	TOT
Function									
11								(42)	72
12								(2)	2
13								(6)	7
14									
21			2			1		777	972
22								(194)	271
23								(37)	48
24					1	1		(562)	716
31								(409)	440
32								(10)	10
33								(5)	6
34								(32)	37
99								(26)	30
0								81	398
TOT			2		1	2		2183	3009

Figure 7-19. -- Coincidence: Percentage Error Elimination For Function and Non-involved Actor Location (Central Group)

Independent Variables	Relationship		
	Fn.>NAL	NAL>Fn.	Fn.,NAL
All Classrooms	28% *	9% *	14%
1st Grade	24% *	8% *	14%
6th Grade	22% *	4%	10%
11th Grade	48% *	14% *	21%
Mathematics	32% *	12% *	18%
Social Studies	23% *	5% *	10%
Younger Teachers	37% *	14% *	19%
Older Teachers	23% *	3%	10%
Female Teachers	30% *	12% *	17%
Male Teachers	28% *	5%	12%
Male 6th Grade	17% *	0%	7%
Female 6th Grade	38% *	17% *	21%
Male 11th Grade	50% *	13% *	19%
Female 11th Grade	44% *	17% *	24%

Note: * denotes significance at .01 or better.

Figure 7-20. -- Independent Variable Coincidence Comparisons

Function and Non-involved Actor Location (Central Group)

Independent Variables	z Scores	
	Fn.>NAL	NAL>Fn.
1st vs. 6th	.35	1.43
6th vs. 11th	-3.87 *	-3.40 *
1st vs. 11th	-3.49 *	-1.77
Math vs. S.S.	1.68	2.44
-30 vs. +40	2.61 *	4.22 *
F vs. M	0.23	2.57
M 6th vs. 11th	-4.05 *	-3.31 *
F 6th vs. 11th	-0.52	-0.00
6th M vs. F	-2.25	-3.97 *
11th M vs. F	0.50	-0.72

Note: * denotes significance at .01 or better.

Figure 7-21. -- Coincidence: Resided Percentage Error Elimination For Function And Non-involved Actor Location (Central Group)

Independent Variables	Relationship		
	Fn.>NAL	NAL>Fn.	FN.,NAL
All Classrooms	,1%	5%	4%
1st Grade	0%	11%	7%
6th Grade	4%	3%	3%
11th Grade	0%	13%	11%
Mathematics	0%	8%	7%
Social Studies	5%	8%	7%
Younger Teachers	4%	15% *	11%
Older Teachers	0%	5%	4%
Female Teachers	3%	11%	9%
Male Teachers	0%	0%	0%
Male 6th Grade	0%	0%	0%
Female 6th Grade	0%	21%	13%
Male 11th Grade	0%	11%	8%
Female 11th Grade	0%	8%	6%

Note: * denotes significance at .01 or better.

seldom coexist. In Figure 7-18 this can be seen in the large concentration in row 0 (no codeable central function) and column 11 (diffusely located non-involved actors). In Figure 7-20, again we find that these relationships are significantly stronger for: eleventh grade classes than sixth grade classes (particularly for male teachers); for younger teachers than for older teachers; and for female teachers' over male teachers' classes at the sixth grade level.

If the situation is redefined to include only the set of events in which non-involved actors do exist and the central group function is discernible, very little predictability remains. Figure 7-21 presents the revised results for function and non-involved actor location. Excluding events of no codeable function (row 0) and of no existing non-involved actors (column 0), the ability to predict location of non-involved actors by knowing group function disappears (revised Lambda Function>Non-involved Actor Location = .010). This supports the statement that the original predictability was entirely due to the exclusiveness (incompatibility) of active central group function and non-involved actors. The ability to predict significantly from non-involved actor location to central group function in this redefined situation also becomes insignificant for all classrooms (revised Lambda Non-involved Actor Location>Function = .054).

In the redefined situation no significant differences between most groups of classrooms remain. However, for younger teachers' classes, knowing something about non-involved actor location permits the elimination of 15 percent of error in predicting function (revised Lambda Non-involved Actor Location>Function = .151 for younger teachers' classes). This result is significant.

Figure 7-22. -- Coincidence Of Function And Non-involved Actor Location For Younger Teachers' Classes (Central Group)

Location Function	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	29	0	0	0	0	0	0	0	0	0	0	0	0	0	(1)
22	20	0	0	0	0	0	0	0	0	0	(1)	(2)	0	0	0
23	9	0	0	0	0	0	0	0	0	0	0	0	0	0	(1)
24	36	0	0	0	0	0	0	0	0	0	0	0	0	0	(1)
31	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(0)	171	0	0	0	0	0	0	0	0	1	0	0	0	0	0
TOTAL	275	0	0	0	0	0	0	0	0	1	1	2	0	0	3

Location Function	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
11	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	(12)	0	0	0	0	5	(2)	0	0
22	0	(2)	0	0	0	0	5	0	0	0	0	3	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	2	0	(2)	0
31	0	0	0	0	0	0	2	0	0	0	0	(7)	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	2	0	0	0	0	21	0	0	0	0	18	2	2	0

(Continued on next page)

Legend: Function - See Figure 7-1.
Location - A Location score is constructed by combining two categories, one each from the vertical and horizontal dimensions, respectively.

(Vertical Dimension)
1 = Diffuse (General)
2 = Front
3== Forward
4 = Middle
5 = Rearward
6 = Rear

(Horizontal Dimension)
1 = Diffuse (General)
2 = Right
3 = Right centre
4 = Centre
5 = Left centre
6 = Left

Figure 7-22. (Continued)

Location	61	62	63	64	65	66	99	(0)	TOT
Function									
11								24	27
12								2	2
13								6	6
14									
21			(2)					(401)	(452)
22								120	153
23								31	41
24								304	345
31								224	241
32								3	3
33								4	5
34								20	20
99								17	18
0								50	222
TOT			2					1206	1535

Figure 7-22 arrays the coincidental events defined by considering central group function and non-involved actor location jointly for classes of younger teachers. From the figures in parentheses it follows that if non-involved actors are diffusely located (code #11 column), information about organization (code #24 row) is most likely. If non-involved actors are located in the center of the classroom (code #44), information dissemination about relevant subject matter (code #21 row) is most likely. If non-involved actors are located in the rear row of seats to the right (code #53) intellectualization about relevant subject matter (code #31 row) is most likely.

Function and Communication Structure

Figure 7-23 arrays the coincidental events defined by considering central group function and communication structure for all classrooms. In order to compare these two variables meaingfully, it is necessary to omit two sorts of data: first, those categories of communication structure which exclude by definition the existence of a central group (columns 2, 3, 4, 8, 9, 10, 14) because they would coexist with non-codeable data for central group function; and second, the category that records the non-existence of a communication system (row 0).

Figure 7-24 presents error percentages results from the Lambdas derived from this matrix and matrices for sub-groups of classrooms.

Knowledge of group function does not enable prediction of communication structure (Lambda Function > CSS = .000), and all differences among groups of classrooms are non-significant.

For all classrooms, knowledge of communication structure does not enable prediction of central group function (Lambda CCS>Function =

Figure 7-23. -- Coincidence Of Function And Communication Structure (Central Group) For All Classrooms

CSS Function	1	(2)	(3)	(4)	5	6	7	(8)	(9)	(10)	11	12	13	(14)	15	(0)	TOT
11	51	0	0	0	16	5	24	0	0	0	1	2	0	0	0	0	99
12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
13	4	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	8
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	(921)	0	0	0	(269)	39	(234)	0	0	0	44	(163)	20	0	(51)	0	1741
22	206	0	0	0	116	29	66	0	0	0	(62)	28	5	0	19	0	531
23	29	0	0	0	10	1	9	0	0	0	4	2	1	0	1	0	57
24	559	0	0	0	157	(55)	131	0	0	0	52	54	(13)	0	24	1	1046
31	465	0	0	0	119	18	35	0	0	0	24	14	3	0	4	0	682
32	8	0	0	0	3	1	0	0	0	0	2	0	0	0	0	0	14
33	4	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	7
34	30	0	0	0	16	2	5	0	0	0	5	3	0	0	1	0	62
99	22	0	0	0	9	5	2	0	0	0	2	2	0	0	1	0	43
(0)	0	25	4	323	0	0	0	(21)	(339)	(86)	0	0	0	(224)	0	(50)	1072
TOTAL	2301	25	4	323	720	155	507	21	339	86	196	269	42	224	101	51	5364

Legend: Function - See Figure 7-1.
Communication Structure.

1 = Central group
2 = $Peripheral_1$
3 = $Peripheral_2$
4 = Noninvolved
5 = Central & Ph_1
6 = Central & Ph_2
7 = Central & Noninvolved
8 = Ph_1 & Ph_2
9 = Ph_1 & Noninvolved
10 = Ph_2 & Noninvolved
11 = Central & Ph_1 & Ph_2
12 = Central & Ph_1 & Noninvolved
13 = Central & Ph_2 & Noninvolved
14 = Ph_1 & Ph_2 & Noninvolved
15 = Central & Ph_1 & Ph_2 & Noninvolved
0 = No sub-groups

Figure 7-24. -- Coincidence: Percentage Error Elimination For Function And Communication Structure (Central Group)

Independent Variables	Relationship		
	Fn.>CCS	CCS>Fn.	Fn.,CCS
All Classrooms	0%	1%	0%
1st Grade	0%	2%	1%
6th Grade	0%	2%	0%
11th Grade	0%	4%	3%
Mathematics	0%	0%	2%
Social Studies	0%	0%	0%
Younger Teachers	0%	2%	1%
Older Teachers	0%	0%	0%
Female Teachers	0%	1%	1%
Male Teachers	0%	3%	2%
Male 6th Grade	6%	6%	6%
Female 6th Grade	0%	3%	2%
Male 11th Grade	0%	3%	2%
Female 11th Grade	2%	14% *	9%

Note: * denotes significance at .01 or better.

Figure 7-25. -- Coincidence Of Function And Communication Structure For Eleventh Grade Female Teachers (Central Group)

CSS Function	1	(2)	(3)	(4)	5	6	7	(8)	(9)	(10)	11	12	13	(14)	15	(0)	TOT
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	(80)	0	0	0	15	0	5	0	0	0	1	0	0	0	0	0	(101)
22	22	0	0	0	11	(4)	(12)	0	0	0	(7)	(7)	(1)	0	(4)	0	68
23	3	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	7
24	23	0	0	0	11	1	7	0	0	0	5	2	0	0	1	0	50
31	68	0	0	0	(17)	0	2	0	0	0	1	0	0	0	0	0	88
32	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	3	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	8
(0)	0	2	0	26	0	0	0	1	25	4	0	0	0	16	0	4	78
TOTAL	201	2	0	26	61	6	28	1	25	4	14	9	1	16	5	4	403

Legend: Function - See Figure 7-1.
Communication Structure
1 = Central group
2 = Peripheral$_1$
3 = Peripheral$_2$
4 = Noninvolved
5 = Central & Ph$_1$
6 = Central & Ph$_2$
7 = Central & Noninvolved
8 = Ph$_1$ & Ph$_2$
9 = Ph$_1$ & Noninvolved
10 = Ph$_2$ & Noninvolved
11 = Central & Ph$_1$ & Ph$_2$
12 = Central & Ph$_1$ & Noninvolved
13 = Central & Ph$_2$ & Noninvolved
14 = Ph$_1$ & Ph$_2$ & Noninvolved
15 = Central & Ph$_1$ & Ph$_2$ & Noninvolved
0 = No sub-groups

Figure 7-26. -- Coincidence of Central and Peripheral Function For All Classrooms

Central Peripheral	11	12	13	14	21	22	23	24	31	32	33	34	99	0	TOT
11	1	0	0	0	0	0	0	1	0	0	0	0	17	57	76
12	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
13	0	0	0	0	0	0	0	0	0	0	0	0	3	5	8
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	6	1	0	12	0	0	0	(1)	(407)	(1093)	1520
22	0	0	0	0	1	0	0	0	0	0	0	0	151	267	419
23	0	0	0	0	0	0	0	0	0	0	0	0	14	38	52
24	0	0	0	0	0	1	1	1	1	0	0	0	244	673	921
31	0	0	0	0	1	0	0	1	1	0	0	0	127	482	612
32	0	0	0	0	0	0	0	0	0	0	0	0	5	9	14
33	0	0	0	0	0	0	0	0	0	0	0	0	2	4	6
34	0	0	0	0	0	0	0	0	1	0	0	0	21	37	59
99	0	0	0	0	1	1	0	0	0	0	0	0	9	26	37
0	(1)	(1)	(4)	0	(71)	(49)	(9)	(65)	(47)	(2)	0	0	263	427	939
TOTAL	2	1	4	(0)	80	52	10	80	50	2	(0)	1	1263	3120	4665

Legend: Function - See Figure 7-1.

.013). All differences among groups of classrooms are non-significant. However, for eleventh grade female teachers' classrooms only, knowledge of communication structure permits the elimination of 14 percent of the errors in predicting to central group function (Lambda CCS > Function = .138 for eleventh grade female teachers). This result is significant. The coincidental events for eleventh grade female teachers are presented in Figure 7-25. The figures in parentheses show that if central group exists (code #1), information dissemination about relevant subject matter (code #2) is most likely.

Again, if the communication system consists of a central plus peripheral grouping (code #5), then intellectualization about relevant subject matter (code #31) is most likely to exist in the central group. For all other communication systems which include central and other groupings, (code #3, 6, 7, 11, 12, 15) information dissemination about non-relevant subject matter (code #22) is most likely to exist in the central group.

Central Group Function and Peripheral$_1$ Group Function

Figure 7-26 arrays the coincidental events for central group function and peripheral group$_1$ function for all classrooms. Figure 7-27 presents error percentages derived from Lambda scores for this matrix and other matrices of groups of classrooms for this same two-variable comparison, and Figure 7-28 presents z scores comparing sub-groups of classrooms.

Note that central group function and peripheral group function do not predict equally to one another. Knowledge of central group function does not permit the elimination of a significant proportion of error

Figure 7-27. -- Coincidence: Percentage Error Elimination For Central Function and Peripheral Function

Independent Variables	Relationship		
	CFn.>PFn.	PFn.>CFn.	CFn.,PFn.
All Classrooms	0%	7% *	5%
1st Grade	0%	6% *	4%
6th Grade	0%	11% *	7%
11th Grade	0%	5% *	4%
Mathematics	0%	11% *	8%
Social Studies	0%	2%	1%
Younger Teachers	0%	11% *	8%
Older Teachers	0%	3%	2%
Female Teachers	0%	11% *	7%
Male Teachers	0%	3%	2%
Male 6th Grade	0%	0%	0%
Female 6th Grade	0%	21% *	13%
Male 11th Grade	0%	6% *	4%
Female 11th Grade	2%	5%	4%

Note: * denotes significance at .01 or better.

Figure 7-28. -- Independent Variable Coincidence Comparisons: Central Function and Peripheral Function

Independent Variables	z Scores	
	CGFn.>PGFn.	PGFn.>CGFn.
1st vs. 6th	0.05	-1.93
6th vs. 11th	-0.04	2.46
1st vs. 11th	0.01	0.30
Math vs. S.S.	-0.00	4.40 *
-30 vs. +40	0.06	4.02 *
F vs. M	-0.00	3.50 *
M 6th vs. 11th	0.05	-1.55
F 6th vs. 11th	-0.21	3.71 *
6th M vs. F	0.05	-5.47 *
11th M vs. F	-0.21	0.08

in predicting peripheral group function (Lambda Central Function> Peripheral Function = .000). Knowledge of peripheral group function permits the elimination of 7 percent of error in predicting central group function (Lambda Peripheral Function>Central Function = .073). This result is significant. However Lambdas for Peripheral Function > Central Function (Figure 7-27) do not reach significance for social studies, older teachers', male teachers', male 6th grade teachers' or eleventh grade female teachers' classes.

The underlined figures in Figure 7-26 contain an explanation of these results. Regardless of central function code, the most usual peripheral category -- no peripheral function (code #0 column) -- would be predicted. Again, if peripheral group function is indeterminate (code #99 column), or nonexistent (code #0 column), then information dissemination about relevant subject matter (code #21 row) is most likely. If peripheral group function falls into any other category, it is most likely that no central function exists (code #0 row). The obvious conclusion from these figures is that an actively functioning central group and an actively functioning peripheral group are largely mutually exclusive. As Figure 7-28 shows, this relationship is stronger for mathematics than for social studies classes, for younger teachers' than for older teachers' classes, for female teachers' than for male teachers' classes (particularly at the sixth grade level), and for eleventh grade over sixth grade female teachers' classes.

Function (Peripheral Group) and Communication Structure

Figure 7-29 arrays the coincidental events defined by considering peripheral group$_1$ function and communication structure for all classrooms.

Figure 7-29. -- Coincidence of Function And Communication Structure (Peripheral Group) For All Classrooms

CSS	(1)	2	(3)	(4)	5	(6)	(7)	8	9	(10)	11	12	(13)	14	15	(0)	TOT
Function																	
11	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	3
12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
13	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	4
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	(6)	0	0	2	0	0	2	(76)	0	0	(7)	0	46	0	0	139
22	0	2	0	0	1	0	0	(9)	34	0	0	1	0	32	(2)	0	81
23	0	1	0	0	0	0	0	1	5	0	0	1	0	3	0	0	11
24	0	2	0	1	(8)	0	0	6	47	1	(1)	(7)	0	23	1	0	97
31	0	4	0	0	2	0	0	1	61	0	(1)	1	0	(48)	0	0	118
32	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	5
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
99	1	12	0	0	592	0	0	9	201	0	166	216	0	125	83	0	1405
(0)	823	0	4	322	0	134	328	0	0	85	0	0	35	0	0	51	1782
TOTAL	824	28	4	323	607	134	328	28	430	86	168	233	35	282	86	51	3647

Legend: Function - See Figure 7-1

Communication Structure

1 = Central group
2 = Peripheral$_1$
3 = Peripheral$_2$
4 = Noninvolved
5 = Central & Ph$_1$
6 = Central & Ph$_2$
7 = Central & Noninvolved
8 = Ph$_1$ & Ph$_2$
9 = Ph$_1$ & Noninvolved
10 = Ph$_2$ & Noninvolved
11 = Central & Ph$_1$ & Ph$_2$
12 = Central & Ph$_1$ & Noninvolved
13 = Central & Ph$_2$ & Noninvolved
14 = Ph$_1$ & Ph$_2$ & Noninvolved
15 = Central & Ph$_1$ & Ph$_2$ & Noninvolved
0 = No sub-groups

In order to compare these two variables meaningfully, it is necessary to exclude those categories of communication structure which preclude by definition the existence of a peripheral group (columns 1, 3, 4, 6, 7, 10, 13), the existence of no communication group (column 0), and which preclude the existence of function (row 0). Figure 7-30 presents the error percentages derived from Lambda scores, and Figure 7-31 presents the z scores.

Peripheral group function and communication structure do not predict equally to one another. Knowledge of peripheral group function allows one to eliminate 17 percent of error in predicting communication system structure (Lambda Peripheral Function>CCS = .172). This result is significant. The corresponding Lambdas for social studies, male sixth grade teachers' and female eleventh grade teachers' classes do not achieve significance. Knowledge of communication structure does not enable one to eliminate a significant proportion of error for all classrooms (Lambda CCS>Peripheral Function = .000), and no significant differences exist between groups of classes.

However, for sixth grade female teachers, knowledge of communication structure allows one to eliminate 19 percent of error in predicting peripheral group function (Lambda CCS>Peripheral Function = .186 for sixth grade female teachers). This result is significant.

An examination of the underlined figures in Figure 7-29 reveals that if peripheral function is determinable (code #11-34), the communication system is most likely to consist of a peripheral group, plus non-involved actors (code #9). If peripheral function exists, but is undeterminable (code #99), the communication system is most likely to

Figure 7-30. -- Coincidence: Revised Percentage Error Elimination For Peripheral Function And Communication Structure

Independent Variables	Relationship		
	PFn.>CCS	CCS>PFn.	PFn.,CCS
All Classrooms	17% *	0%	13%
1st Grade	14% *	0%	10%
6th Grade	12% *	3%	9%
11th Grade	12% *	1%	10%
Mathematics	17% *	0%	11%
Social Studies	5%	1%	4%
Younger Teachers	26% *	1%	18%
Older Teachers	7% *	0%	6%
Female Teachers	27% *	0%	17%
Male Teachers	7% *	0%	6%
Male 6th Grade	1%	0%	1%
Female 6th Grade	31% *	19% *	25%
Male 11th Grade	14% *	0%	11%
Female 11th Grade	9%	12%	9%

Figure 7-31. -- Independent Variable Coincidence Comparisons:
Peripheral Function and Communication Structure

Independent Variables	z Scores	
	PGFn.>CCS	CCS>PGFn.
1st vs. 6th	0.35	-0.25
6th vs. 11th	-0.04	0.15
1st vs. 11th	0.27	-0.08
Math vs. S.S.	3.13 *	-0.11
-30 vs. +40	3.48 *	0.12
F vs. M	5.88 *	0.03
M 6th vs. 11th	-2.00	0.00
F 6th vs. 11th	2.63 *	0.19
6th M vs. F	-4.88 *	-0.84
11th M vs. F	0.66	-0.37

Note: * denotes significance at .01 or better.

Figure 7-32. -- Coincidence of Function and Communication Structure For Sixth Grade Female Teachers (Peripheral Group)

CSS	(1)	2	(3)	(4)	5	(6)	(7)	8	9	(10)	11	12	(13)	14	15	(0)	TOT
Function																	
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	(6)	0	0	0	0	0	(2)	(50)	0	0	0	0	36	0	0	94
22	0	1	0	0	0	0	0	1	(10)	0	0	0	0	8	0	0	20
23	0	0	0	0	0	0	0	0	(2)	0	0	0	0	1	0	0	3
24	0	0	0	1	7	0	0	1	(29)	1	1	0	0	10	0	0	50
31	0	4	0	0	0	0	0	1	(53)	0	0	0	0	(41)	0	0	99
32	0	0	0	0	0	0	0	0	(3)	0	0	0	0	2	0	0	5
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	2	0	0	(128)	0	0	(2)	32	0	(29)	(10)	0	16	(2)	0	221
(0)	170	0	0	50	0	24	23	0	0	21	0	0	1	0	0	10	299
TOTAL	170	13	0	51	135	24	23	7	179	22	30	10	1	114	2	10	791

Legend: Function - See Figure 7-1

consist of a central group plus a peripheral group (code #5). These tendencies are stronger for: mathematics than for social studies classes; for younger teachers' than for older teachers' classes; for female teachers' than for male teachers' classes; and for sixth grade female teachers' than for either male sixth grade teachers' or eleventh grade female teachers' classes as Figure 7-31 shows.

The figures in parentheses show that regardless of the communication structure which exists, peripheral function is likely to be indeterminable (code #99).

Figure 7-32 arrays the coincidental events defined by considering peripheral group function and communication system jointly for female sixth grade teachers. The parenthetical figures in the table show that most communication system structures (codes #5, 8, 11, 12, 15) coexist most frequently with indeterminable peripheral function (99). Others predict differentially to certain peripheral function categories: (i) Communication systems consisting of peripheral group only (code #2) and of peripheral group plus non-involved actors (code #9) most frequently coexist with information dissemination about relevant subject matter (code #21); (ii) a communication system consisting of two peripheral groups plus non-involved actors (code #14 column) most frequently coexist with intellectualization about relevant subject matter (code #31).

Summary

Thirty-two attempts were made to predict between one variable class and another. Of these, eleven produced significant results. They were, respectively:

Central Function > Role Structure (4%)

Central Function > Teacher Role Assignment (and vice versa) (15% and 20%)

Central Function > Teacher Location (and vice versa) (11% and 9%)

Central Function > Non-involved Actor Location (and vice versa) (28% and 8%)

Central Non-involved Role Allocation > Function (revised analysis, 12%)

Peripheral Function > Central Function (7%)

Peripheral Function > Communication Structure (17%)

These gross findings, however, conceal the fact that predictability in these instances derived from the interaction of specific variables. They are listed below in the form of propositions.

Proposition 7-1. Information dissemination about relevant subject matter and organization and intellectualization about organization, all predict to a two role system -- Emitter and Audience.

Proposition 7-2. When function cannot be determined it is likely that the teacher is the target, and where there is no central function the teacher is likely to be non-involved. All the other functional categories show the teacher as emitter in the central group.

Proposition 7-3. When the teacher is either non-involved or is a member of a peripheral group, no central function is likely. When the teacher is in the central group, information dissemination of relevant subject matter is likely. (It is noteworthy that when these negative cases are eliminated, no predictability between teacher role assignment and function remain).

Proposition 7-4. When central group function exists, the teacher is likely to occupy the center front of the room. If there is no function, the teacher is likely to be diffusely located.

Proposition 7-5. There is a predictable relationship between teachers' occupancy of diffuse locations and the existence of no central group function. If the teacher occupies outskirt locations then information dissemination about organizational matters is likely. If the teacher is out of the room then no function at all is likely. (Again, the elimination of the "negative" instances destroys predictability).

Proposition 7-6. Non-involved actors tend to be dispersed throughout the classroom and do not tend to be existent where there is a central group.

Proposition 7-7. When there is central group function then no non-involvement is likely. When the teacher and a pupil segment are non-involved, it is likely that no central function exists.

Proposition 7-8. If the peripheral function is indeterminate or non-existent then information dissemination of relevant subject matter is likely. Central function and peripheral function tend to be mutually exclusive.

Proposition 7-9. If peripheral function exists then a peripheral communication structure is likely. (1 peripheral group plus non-involveds)

The following predictions failed to yield significant results:

Function > Role Structure (and vice versa)

Function > Role Allocation (and vice versa)

Function > Emitter, Target and Audience Locations (and vice versa)

Function > Non-involved Actor Location (and vice versa)

Function > Communication Structure (and vice versa)

Central Function > Peripheral Function

Communication Structure > Peripheral Function

When the findings from the specific sub-groups were considered perhaps the single most striking feature was their general uniformity. For example, the range of percentage error elimination when Function is used to predict to Teacher Role Assignment was only 11% to 17%. In general, non-conformist scores were rare and these did not constitute a consistent pattern of non-conformity either. The more dramatic individual results were:

Grade 1	: Function > Non-involved Role Allocation	(35%)
Grade 11	: Function > Non-involved Role Allocation	(37%)
	: Function > Non-involved Actor Location	(48%)
Mathematics	: Non-involved Role Allocation > Function	(19%)
Younger Teachers	: Function > Non-involved Actor Location	(37%)
F 6th Grade	: Teacher Role Assignment > Function	(42%)
M 11th Grade	: Function > Non-involved Role Allocation	(38%)
	: Function > Non-involved Actor Location	(50%)
F 11th Grade	: Function > Teacher Location	(22%)
	: Teacher Location > Function	(28%)
	: Function > Non-involved Role Allocation	(38%)
	: Function > Non-involved Actor Location	(44%)

When we turn to the problem of analyzing differential predictability between functional and structural variables by independent variable class, it becomes clear immediately that the classrooms were not equal to one another. Results, however, are buried in Figures 7-7, 7-12, 7-20, 7-28, and 7-31, and a summary of them is needed. This is provided in Figure 7-33. Figure 7-33 reveals a number of findings which may be summarized in the form of propositions.

Grade Level. The first three propositions deal with grade level as an independent variable.

Proposition 7-10. Sixth grade classes exhibit greater predictability from teacher role assignment to central group function than do either first or eleventh grade classes.[1]

Proposition 7-11. Sixth grade classes exhibit less predictability from teacher location to central group function than do either first or eleventh grade classrooms.

Proposition 7-12. Eleventh grade classrooms exhibit more predictability from central group function to non-involved actor location (and vice versa) than do first or sixth grade classrooms. Each of these propositions is supported not only by findings from the first three lines of Figure 7-33 but by supportive findings from the male or female comparisons in lines seven and eight. Together these propositions suggest that sixth grade classes are more dependent on the teacher -- albeit less "traditional" -- and that for them the traditional classroom culture has been replaced by one that hangs on teacher role (defined both in terms of assignment and location). Eleventh grade classrooms exhibit a formal, reciprocal relationship between function and non-involved actor location suggesting that only

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[1] Note that "predictability" in Propositions 7-10 through 7-15 refers to the limited interpretation of functional-structural predictability discussed in Propositions 7-1 through 7-9.

Figure 7-33. -- Statistically Significant Coincidence Comparisons By Independent And Dependent Variable Classes

Independent Variables	Predictions From				
	Central Function to				Peripheral Function to
	Teacher Role Assignment	Teacher Locations	Non-involved Actor Locations	Peripheral Function	Communications Structure
1st/6th		(+)			
6th/11th	(+)	(-)	- (-)		
1st/11th			-		
Math./S.S.	+ (+)	(+)		(+)	+
-30/+40	(+)	(+)	+ (+)	(+)	+
F/M	(+)			(+)	+
M6th/11th			- (-)		-
F6th/11th	(+)	(-)		(+)	+
6thM/F	(-)		(-)	(-)	-
11thM/F		(-)			

Note: Entries are signed positively if classrooms exhibiting the first listed independent variable are more predictive, negatively if they are less predictive. Entries without parentheses pertain to predictions from function to structure, entries with parentheses to structure > function predictions.
Entries are significant at $p < .01$ and were drawn from Figures 7-7, 7-12, 7-20, 7-28, and 7-31.

when the central group collapses do non-involved persons appear at this level.

Subject Matter. A single proposition will suffice to summarize findings for subject matter.

Proposition 7-13. Mathematics classes exhibit greater predictability between structural and functional properties than do social studies classes.

This proposition holds for each dependent variable appearing in Figure 7-33: For predictions from teacher role assignment, teacher location, non-involved actor location, and peripheral function to central function; and from central function to teacher role assignment; and from peripheral function to communication structure. Evidently, mathematics classes evidence a more formal structure, and this formality applies to a wide variety of structural-functional relationships.

Teacher Age. A nearly-identical result obtains for teacher age.

Proposition 7-14. Classes with younger teachers exhibit more predictability between structural and functional properties than do classes with older teachers.

As with subject matter, Proposition 7-14 holds across the board: for predictions from teacher role assignment, teacher location, non-involved actor location, and peripheral function to central function; from central function to non-involved actor location; and from peripheral function to communication structure. Evidently, classes with younger teachers were also more structured. It is interesting to observe , however, that while the strongest result for subject matter comparisons was obtained for teacher role assignment, the strongest result for teacher age appeared for the non-involved actor location variable. This suggests that structure within mathematics classes is teacher-enforced, while structure within younger teachers' classrooms may depend upon pupil participation.

Teacher Sex. Finally, there was also a similar finding for sex of the teacher as an independent variable.

Proposition 7-15. Classes with women teachers exhibit more predictability between structural and functional properties than classes with men teachers.

This finding holds for predictions between teacher role assignment, non-involved actor location, and peripheral function and central function, and between peripheral function and communication structure. (Note also that these findings are all supported by supplementary findings from lines nine or ten of the table indicating that the general proposition is not a grade-artifact.) Note also that there was no significant relationship between teacher sex and relationship between teacher location and function. It will be recalled from Chapter VI that no relationship between teacher sex and teacher location was found; we now know additionally that relationships between this variable and central function did not differentiate classes by sex of teacher.

Overview. In general, the data from the functional-structural comparisons are somewhat disappointing in that they show a general lack of interdependency. They also tend to reveal more similarities across classroom types and dependent variable categories than differences.

For example, irrespective of function, the role allocation most likely to occur is #104 when the teacher is the emitter, there is no target, and there is a quorum audience. Again, irrespective of the function, the next most probable role allocation is #214 (pupil emitter, teacher target, quorum audience) and next most likely is #124. When predicting in the other direction, irrespective of the pattern of role allocation prevailing, function #21 (information dissemination about relevant subject matter) is most likely to occur. However, the secondary pattern is less well defined. It tends to vacillate between #24 (information dissemination about organization) and #31 (intellectualization about relevant subject matter). Inspection of the data suggests that when the teacher is emitter the loading favors #24, and when the teacher is the target the loading favors #31.

The cross relating of functional and structural data consistently reveal a similar distribution of scores with a loading along one column and down one row. This is so in every case except one - function and communication structure. In this case, while all functions load in a "central group only" structure, some of the structures load diffusely. The major loadings, however, are confined to few functional variables, viz., #21, 22, 24, and #31. Whenever there is a central group operating, the rank order of loadings is 21, 24, 31 or 22. If there are two peripheral groups then first rank goes to 22, 24, 21. If there is a secondary peripheral group in association with the central one, then the first loading goes to 24, the second to 21 and third to 22.

The implication of these findings will be discussed at the end of the next section which deals with structural - structural comparisons.

Findings for Structural - Structural Dependent Variable Pairs

This section is concerned with the coincidence of structural variables. Again, variable classes are analyzed in pairs to determine the extent to which the two classes are found to coexist. For the analysis, the data were ordered into matrices with each of the two dimensions representing one of the variable classes. The matrices show the number of instances when each of the variables within a variable class was recorded as existing at the same time as each of the variables in the other variable class. The matrices thus provide a series of frequency counts. Some interpretations of the relative strength of any pair of variables can be gained by inspection of these tables and in particular by comparing the frequency with the total number of incidents involved.

A second strategy has also been used in interpreting the data. The extent to which knowledge of one variable class may permit the elimination of errors in predicting to the second variable class has also been examined. The statistic used (Lambda) permits a gross comparison of this kind. Lambdas may also be compared, and tables are presented reporting z scores that result from comparing pairs of independent variable sets.

The analyses used to not permit any predictive statement of the extent to which a specific variable within a variable class co-exists with any other specific variable. No statistic was found that could economically accomodate the immense number of calculations involved. Consequently, associations of this kind represent inspection interpretations rather than statistically validated findings.

The selection of pairs of variable classes for analysis was determined by whether or not the association was free of built-in redundancy and whether there were sufficient data. For example, the amount of data available in peripheral group structure warranted only two pairings. Figure 7-34 below shows which variables were cross-related.

Figure 7-34. -- Structural Variable Classes Cross-Related for Coincidence Comparisons

Structural Variable Classes	Central Group									Peripheral	
					Location						
	CS	RS	RA	TRA	E	TAR	A	T	NA	RA	RS
Communication Structure		(X)	X	X				X		X	X
Role Structure				X				X			
Role Allocation				(X)	X	X	X	X	(X)		
Teacher Role Assignment					X	X		X			
Emitter Location								X			
Target Location								X			
Audience Location								(X)			
Teacher Location											
Non-involved Actor Location											
Peripheral Role Allocation											
Peripheral Role Structure											

Some of the entries in Figure 7-34 are enclosed in parentheses, in which case a pairing of the two variable classes was made with but insignificant results. These four cases will not be textually interpreted.

The presentation of the findings has been systematized in the following way. Each of the structural variable classes is treated in the order of the listing in Figure 7-34, and in each case the results of all the pairings are given together with an interpretative discussion. The section concludes with a general commentary.

Communication Structure and Role Allocation

Role allocation predicts more strongly to communication structure than communication structure predicts to role allocation. Role allocation specifies whether individual actors, a segment of the class, or the class quorum occupy the roles of emitter, target and audience, respectively. Communication structure specifies whether there is a central communication group and whether there are peripheral groups and non-involved actors. With information on role allocation it is possible to eliminate 13% of the error in predicting communication structure. Lambda = .128 and is significant. This result holds good for all the independent variable sub-groupings except eleventh grade, younger teachers, female sixth and eleventh grade teachers, and male eleventh grade teachers. The significant Lambdas range from .071 or 7% to .276 or 28%. The comparisons of the independent variable classes showed that the predicting of communication structure from role allocation was significantly better for:

sixth grade vs. first grade

sixth grade vs. eleventh grade

mathematics classes vs. social studies

older teachers vs. younger teachers

male teachers vs. female teachers

male sixth grade vs. male eleventh grade

male sixth grade vs. female sixth grade

An examination of the matrix (Figure 7-35) shows that the strength of this predictive power of Role Allocation lies principally in the fact that most role allocation variables predict to the central group only (column 1). Twenty-six of the 46 role allocations listed load most heavily on this variable. When the vacuum incidents are eliminated, this variable is found to accommodate 62% of all incidents. While this indicates that a central system remains largely unaffected by changes in role structure, it is nonetheless worthwhile to examine the role allocations in the rows where the distribution of frequencies is at odds with the prevailing pattern. The most striking variations of any magnitude are thrown up by: 103 (Teacher emitter, segment audience); 123 (Teacher emitter, single student target, and segment audience); and 213 (single student emitter, teacher target, segment audience). These three all reflect identical patterns of association and load respectively in columns #7 (central and non-involveds), #12 (central, peripheral$_1$ and non-involveds), and #13 (central, peripheral$_1$, peripheral$_2$, and non-involveds). The explanation of the similar loadings lies in the fact that all may be characterized by the existence of non-involved actors.

Figure 7-35. -- Coincidence of Role Allocation and Communication Structure (Central Group) For All Classrooms

CSS Allocation	1	(2)	(3)	(4)	5	6	7	(8)	(9)	(10)	11	12	13	(14)	15	(0)	TOTAL
101	1 4				1												2
103	6				2		141				3	(77)	(13)		(26)		268
104	(1631)				(289)	(77)	(194)				(73)	36	2		7	1	2360
107	2																2
113	1						2										3
114	2				1		1					1					5
120	4				2		18					2	1		1		28
122	1				1		2				1				1		6
123	28				16	6	79		1		13	54	8		17		222
124	850				167	27	46				28	11	1		3		1133
130	1						1				1				1		4
133	7				3	1	12				1	4	3		4		35
134	27				5	1	2				1	1					37
140	9					1											10
143	2																2
203					3												3
204	3				12		4				1	1			1		22
207	209				43	10	14				2	4			1		283
210	5				7		16					10			5		43
212	3				3	1	8				1	6	1		9		32
213	16				17	6	91				18	45	7		25		225
214	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]		[illegible]	1	1506
217	2																2
220																	
224	11				8		1				2						22
226							2				1	1					4
227	80				22	5					1	1					109
241	5				3						1						9
253											1						1
254	3				1		1										5
304							1					1			1		3
306							2					1					3
307	2																2
313	80				10	1	65					27	4		5		192
314	117				21	2	9				5	1					155
324	1				1		2										4
326	3				2												5
327	9				3	2											14
333	3																3
410	12				1	1	6				1						21
413	7						2										9
504	6																6
603	9						13					1					23
604	11				1												12
700	8				3	1	2										14
[illegible]	9																9
(0)	4344	(25)	(4)	(323)				(21)	(330)	(86)				(224)		(49)	1059
[illegible]		25	4	323	827	176	841	21	330	86	203	211	41	224	111	51	7927

In contrast with these findings, communication structure does not generally permit the elimination of a significant proportion of error in predicting role allocation (Lambda = .016 or 2%). However, five of the subsets of classrooms provide an exception to this rule. They are: 6th Grade (Lambda = .068 or 7%), Mathematics (Lambda = .055 or 6%), Older Teachers (Lambda = .032 or 3%), Male Teachers (Lambda = .045 or 5%), and Male 6th Grade (Lambda = .136 or 14%). Some significant differences were also yielded by the z scores comparisons. Communication Structure predicts role allocation better for: 6th Grade vs. 1st Grade, 6th Grade vs. 11th Grade, Mathematics vs. Social Studies, Male 6th Grade vs. Male 11th Grade, and Male 6th Grade vs. Female 6th Grade. From the matrix, it is apparent that the lack of predictability derives first from the tendency for loadings of comparable weight to be spread up and down the columns and second from the relative symmetry of loadings from column to column. In general most structures tend to be associated first with role allocation #104 (Teacher emitter and Quorum audience), 34% of all incidents, #214 (Pupil emitter, Teacher target and quorum audience) 22% of all incidents, and #124 (Teacher emitter, pupil target and quorum audience) 17% of all incidents. In the four cases of any magnitude where this pattern is not followed (#7, 12, 13 and 15) the nonconformist role allocation variables are #103 (Teacher emitter, segment audience), #123 (Teacher emitter, pupil target, segment audience) and #213 (Pupil emitter, teacher target and segment audience). Again common to all of the associated communication structure variables is the fact that non-involved actors were in evidence.

Figure 7-36. -- Coincidence: Percentage Error Elimination For Role Allocation And Communication Structure (Central Group)

Independent Variables	Relationship		
	RA> CS	CS>RA	CCS,RA
All Classrooms	13% *	2%	6%
First Grade	11% *	0%	4%
Sixth Grade	24% *	7% *	14%
Eleventh Grade	3%	0%	1%
Mathematics	22% *	5% *	11%
Social Studies	7% *	0%	3%
Younger Teachers	5%	1%	2%
Older Teachers	20% *	3% *	9%
Female Teachers	8% *	0%	3%
Male Teachers	20% *	5% *	11%
Male Sixth Grade	28% *	14% *	20%
Female Sixth Grade	3%	1%	2%
Male Eleventh Grade	3%	1%	1%
Female Eleventh Gr.	9%	0%	3%

Figure 7-37. -- Independent Variable Coincidence Comparisons: Role Allocation And Communication System Structure (Central Group)

Independent Variables	z scores	
	RA>CSS	CSS>RA
1st vs. 6th	-3.65 *	-3.23 *
6th vs. 11th	5.23 *	3.09 *
1st vs. 11th	1.95	-0.05
Math vs. S.S.	4.89 *	2.88 *
-30 vs. +40	-4.61 *	-1.48
F vs. M	-3.06 *	-2.52
M6th vs. 11th	5.51 *	5.11 *
F 6th vs. 11th	-0.73	0.17
6th M vs. F	4.63 *	4.82 *
11th M vs. F	-0.83	0.05

It is clear that what distinguishes some classrooms from other classrooms is the extent to which a central group is in existence. The preceding data imply, however, that deviation from certain patterns of interaction (in particular #104 -- Teacher emitter, quorum audience, #124 -- Teacher emitter, pupil target, quorum audience, and #214 -- Pupil emitter, teacher target and quorum audience) is associated with the existence of both non-involved actors and, to a lesser extent, peripheral groups. It is also apparent that the non-involveds constitute a sizeable proportion of the classroom group. The impression given is that if for some reason the teacher ceases to be actively engaged with the central group then many of the classroom members withdraw from involving themselves. On the other hand, it appears that there is no consistent relationship between deviations from the dominant communication structure pattern for the central group and any particular role allocation.

From the independent variable subset comparisons it is apparent that behavior in sixth grade classes and in classes with male teachers tends to be significantly more predictable.

Communication Structure and Teacher Role Assignment

Communication structure and teacher role assignment predict about equally well to one another. Knowing the communication permits the elimination of 12% of the error in predicting teacher role assignment (Lambda = .116). Knowing teacher role assignment permits the elimination of 14% of the errors in predicting the communication structure (Lambda = .142). Both results are significant. All of the results for all of the independent variable subsets are

Figure 7-38. -- Coincidence of Communication Structure and Teacher Role Assignment For All Classrooms

Assignment	1	2	3	4	5	6	7	8	9	0	TOT
CS											
1	(1719)	(1271)	(274)							15	3279
2		1		10	7	2				9	29
3										4	4
(4)					2					322	324
5	434	232	77	13	3					5	764
6	104	46	11								161
7	381	268	33							13	695
8				2	8	2				9	28
9	1			(164)	(108)	5				(181)	459
10					1		1		1	85	88
11	112	71	5	3							191
12	156	106	7	12	4	3				4	292
13	27	13								1	41
14				113	75	(8)				114	310
15	52	41	1	1	1					2	98
(0)	1	1								49	51
TOTAL	2987	2050	406	325	209	20	1	0	1	813	6814

also significant. Two cases revealed comparatively high predictive power. In mathematics classes the amount of error eliminated in predicting from communication structure to teacher role assignment and vice versa was respectively 19% or 22%. In female sixth grade classes the respective percentages were 28% or 30%.

The comparisons of independent variable subsets yielded three cases of significant differences in predictive power from either structural variable class to the other. They were: mathematics classes over social studies classes; sixth grade classes with female teachers over eleventh grade classes with female teachers; and female sixth grade classes over male sixth grade classes.

In addition, teacher role assignment predicted significantly better to communication structure for classes with younger teachers over classes with older teachers and classes with female teachers over classes with male teachers.

From the relevant matrix (Figure 7-39) it can be seen that a central group is more likely to be in existence than is any other communication structure (46% of all incidents). The most common pattern of distribution of communication structure frequencies across the row loads most heavily on teacher role assignment #1 (the teacher is emitter in the central group), next heavily on #2 (teacher is target in the central group), and next heavily on #3 (teacher is audience member in the central group). Nonconformist patterns were, however, thrown up in four cases -- when the communication structure compared: a peripheral group only (#2); two peripheral groups only (#8); a peripheral group plus non-involved actors (#9); and two peripheral groups plus non-involved actors (#14). In all of these exceptional cases a consistent pattern of teacher role assignment was evidenced. The teacher is more likely to be; first, non-involved or out of the room (#0); or second, emitter in the first peripheral group; or third, target in the first peripheral group (#5).

Again Figure 7-38 shows that the teacher's role is more likely to be as an emitter in the central group than anything else (44% of all incidents). He is likely to be target in the central group second (30% of all incidents) and third, non-involved or out of the room (12%). Once again there are two distinct patterns of frequency distributions that emerge from the different communications structure variables. The first is the #1, 2, 3 pattern in which the teacher is likely to be: first, the emitter; second, the target; and third, the audience member in the central group. This is the predominant pattern and holds good for communication structures #1 (central group only), #5 and 6 (central group plus one peripheral group), #7 (central group plus non-involveds), #11 (central group plus two peripheral groups), #12 and 13 (central group plus one peripheral group plus non-involveds), and #15 (central group plus two peripherals plus non-involveds). In fact, the pattern holds good for whenever there is a central group, that is, for 81% of all the incidents. The second pattern is for less pervasive and involves communication structures #2 (one peripheral group only), #8 (two peripheral groups), #9 (one peripheral group plus non-involveds),

Figure 7-39. -- Coincidence: Percentage Error Elimination For Communication Structure And Teacher Role Assignment

Independent Variable	Relationship		
	CCS>RA	RA>CCS	CCS,RA
All Classrooms	12% *	14% *	13%
First Grade	11% *	11% *	11%
Sixth Grade	18% *	18% *	13%
Eleventh Grade	12% *	11% *	12%
Mathematics	19% *	22% *	20%
Social Studies	9% *	5% *	7%
Younger Teachers	16% *	19% *	18%
Older Teachers	13% *	9% *	11%
Female Teachers	15% *	19% *	17%
Male Teachers	13% *	9% *	11%
Male Sixth Grade	16% *	10% *	12%
Female Sixth Grade	28% *	31% *	29%
Male Eleventh Gr.	13% *	11% *	12%
Female Eleventh Gr.	14% *	14%	14%

Figure 7-40. -- Independent Variable Coincidence Comparisons: Communication Structure And Teacher Role Assignment

Independent Variables	z scores	
	CCS>RA	RA>CCS
1st vs. 6th	-2.20	-2.55
6th vs. 11th	1.98	2.18
1st vs. 11th	-0.39	-0.21
Math vs. S. S.	4.27 *	6.60 *
-30 vs. +40	1.69	3.87 *
F vs. M	0.92	3.96 *
M 6th vs. 11th	0.87	-0.34
F 6th vs. 11th	2.91 *	2.68 *
6th M vs. F	-3.21 *	-6.33 *
11th M vs. F	-0.29	-0.42

and #14 (two peripheral groups plus non-involveds.) Its characteristic form is for maximum loading to be on either teacher role assignment #0 (teacher non-involved or out of the room) or on #4 (teacher is emitter in first peripheral sub-systems). The third ranked teacher role assignment is #5 (teacher is target in the first peripheral system).

It seems apparent that the teacher is consistently cast in an active role and that his role is characteristically associated with a centrally organized and oriented classroom group. When the teacher is not active or is out of the room, the central group no longer exists and the prevailing pattern comprises usually a mixture of peripheral groups and non-involved actors. When, however, there are peripheral groups the teacher tends to be involved actively in the primary peripheral group. Associated with the teachers' involvement in peripheral groups is the tendency for non-involved actors to be in evidence also.

Communication Structure and Teacher Location

Communication structure predicts more efficiently to teacher location than vice versa. Knowing which communication system exists permits the elimination of 18% of the error in predicting the teacher's location (Lambda = .175). This result is significant. All the results for the independent variable subset are also significant. The largest of these came from eleventh grade classes with female teachers (Lambda = .331 or 33%) and sixth grade classes with male teachers (Lambda = .251 or 25%).

When the direction of the predicated relationship is reversed, little error elimination occurs (Lambda = .025). However, six of the subsets yield low but significant Lambdas. They are: sixth grade (.088 or 9%), Mathematics classes (.077 or 8%), Older teachers (.067 or 7%), Male teachers (.096 or 10%), Male sixth grade teachers (.157 or 16%), and Female eleventh grade teachers (.155 or 16%).

When the independent variable subsets were contrasted, significant differences in both directions were found in only one case -- eleventh grade classes with female teachers produced significantly higher Lambdas than did eleventh grade classes with male teachers. There were five other significant z scores. From these it can be observed that predicting communication structure from teacher location is better for sixth grade than first grade, for male teachers than female teachers, for male sixth grade teachers than male eleventh grade teachers, and for male sixth grade teachers than female sixth grade teachers. Predicting teacher location from communication structure is better for mathematics classes than social studies classes and female eleventh grade teachers than female sixth grade teachers.

From Figure 7-41, which lists the extent of the coincidence of communication structure variables with teacher location variables, it can be seen that the dominant locations are: #24 (center front) which accounts for 38% of all incidents; and #11 (diffuse, diffuse) which accounts for 22%. The remaining 40% are spread somewhat more evenly over some 16 other locations. When the locations which attract more than a minimal number of instances are examined, three basic patterns are revealed. The first pattern, for locations 23, 24, 25,

Figure 7-41. -- Coincidence of Communication Structure and Teacher Location For All Classrooms

Location	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
CS															
1	296						(2)	(4)	(101)	(909)	(226)	(16)		(21)	(23)
2	2									6	3	3			2
3										1					
4	(316)									2					
5	76							1	12	413	35	4		2	4
6	13								6	24	5			1	1
7	50						1	3	14	201	27	5		20	12
8	2								1	9	1				2
9	179									64	9	1		2	8
10	30									1					
11	4								4	112	12	3		2	2
12	12								4	118	10	1		5	7
13	1									21	1	1		2	1
14	114									41	3			1	3
15	2								1	50	2	1		3	2
0	1									1					
TOTAL	1148						3	8	143	2043	334	35		59	67

Location	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
CS:															
1	(143)	(23)	(104)		9	15	(92)	(25)	(35)		2	4	(107)	(15)	(11)
2	4					1									
3															
4	1					2									
5	47	7	22		2	1	27	4	9				25	4	6
6	6	1	2		1	3	9	1	1				6	1	
7	68	14	14		(21)	(42)	49	5	8		13	4	21	2	4
8	3	1													
9	71	3	2		1	4	13	5	1			4	19	5	2
10	1						1								
11	15	3	3		3	2	8	1	1				4		1
12	13	4	4		14	37	9	1	3		(18)		5	2	1
13	1	1	2			3		1	1			1	1		
14	52	2				3	9	5	1			1	14	7	3
15	5	2	2		2	6	2	3			3		3	3	
0			1										1		
TOTAL	430	61	156		53	119	219	51	60		36	14	206	39	28

(Continued on next page)

Figure 7-41. (Continued)

Location	61	62	63	64	65	66	99	0	TOT
CS									
1			1	4	4	1		33	2226
2					1			10	22
3								3	6
4								3	324
5				1	5	1		9	717
6				1	3			2	137
7			(2)	2				9	611
8					1			9	29
9				(5)	(7)			7	412
10								5	88
11				2	3	1		2	130
12				4				3	273
13			1	1				1	41
14				3	5			9	276
15				2				1	95
0								47	51
TOT			4	25	29	3		153	5526

Figure 7-42. -- Coincidence: Percentage Error Elimination for Communication Structure and Teacher Location

Independent Variables	Relationship		
	[illegible]	[illegible]	[illegible]
All Classrooms	12% *	3%	10%
First Grade	17% *	2%	10%
Sixth Grade	17% *	9% *	17%
Eleventh Grade	20% *	3%	13%
Mathematics	20% *	6% *	14%
Social Studies	14% *	3%	10%
Younger Teachers	13% *	2%	9%
Older Teachers	20% *	7% *	17%
Female Teachers	13% *	0%	5%
Male Teachers	21% *	10% *	13%
Male Sixth Gr.	23% *	14% *	20%
Female Sixth Gr.	17% *	3%	12%
Male Eleventh Gr.	17% *	1%	10%
Female Eleventh Gr.	33% *	13% *	23%

Figure 7-43. -- Independent Variable Coincidence Comparisons: Communication Structure and Teacher Location

Independent Variables	z scores	
	[illegible]	[illegible]
1st vs. 6th	0.17	-2.73 *
6th vs. 11th	-1.09	1.91
1st vs. 11th	-0.84	-0.43
Math vs. S.S.	2.85 *	1.34
-30 vs. +40	-2.37	-2.04
F vs. M	-2.31	-4.01 *
M 6th vs. 11th	2.23	4.11 *
F 6th vs. 11th	-3.37 *	-1.83
6th M vs. F	2.53	3.06 *
11th M vs. F	-3.22 *	-2.50 *

and locations 24, 25, 26 (near center) load communications structure #1 (central group only) first, #5 (central plus peripheral) second, and #7 (central plus non-involveds) third. In fact the structures which include a central group account for 94% of all frequencies at location 24. The second pattern is only a slight variation in the first and is relevant for a swathe of locations up and down the center line of the room; i.e., locations 32 through 36, 44, 45, 46. Again, the greatest loading is in the central group only structure. However, second ranking goes to #7 (central group plus peripheral$_2$) and third to #9 (peripheral$_1$ plus non-involveds).

A third pattern accommodates three off-center locations (42, 43 and 52). The dominant structures are #7 (central plus non-involveds), #12 (central plus peripheral$_1$ plus non-involveds), and #1 (central group only.)

Turning to Communication Structures, it is apparent here that central group only (#1) is the dominant structure. Next in order come #5 (central and one peripheral), #7 (central plus non-involveds), #9 (one peripheral group plus non-involveds), and #4 (non-involveds only). There are several combinations of frequency distribution apparent among the various individual communication structures. Three follow a common pattern; viz., location 24-25, first; 11, second; and 34, third. They are: communication structure #1 (central group only), #5 and #6 (central and a single peripheral group). Four others, #7, 11, 12, and 15, all load on location 24 first. However, #7 (central plus non-involveds) and #11 (central plus two peripheral groups) load 34 next and 11 next -- a reversal of the order above, while for #12 (central plus peripheral$_1$ plus non-involveds) locations 34 and 52 assume second and third rank importance. Two other communication structures load on location 11 almost exclusively. They are #4 (non-involved actors only) and #10 (secondary peripheral groups plus non-involveds). Communication structures #9 (primary peripheral group plus non-involveds) and 14 (two peripheral groups plus non-involveds) also load in location 11 first and then rather evenly in locations 24 and 34. Structure #3 (one peripheral plus non-involveds) has a pattern of its own; viz., locations 11 first, 34 second, and 24 last.

A general interpretation of these data leads to the conclusion that when the teacher occupies the center front of the room the conventional pattern of central group only is in existence. It is also in existence on those relatively few occasions that the teacher is at the back of the room. When the teacher is in between (and he seldom ventures far from a central track) there is a greater likelihood that peripheral groups will be in existence (he may, in fact, be creating them or responding to them). It is also apparent that when the teacher is caught between the front of the room and the back (between wind and water) non-involved actors are in existence.

Communication Structure and Role Allocation in the Primary Peripheral Group.

Knowing the roles allocated in the peripheral group permits the elimination of 26% of the error in predicting communication system structure (Lambda = .260). This result is significant. The independent variable subsets all yield significant Lambdas with the exception of sixth grade classes with male teachers and eleventh grade classes with female teachers. The greatest predictive power is found in classes with younger teachers (35%) and classes with female teachers (32%). The independent variable based comparisons yield significant z scores in four cases. Prediction of communication structure from knowledge of peripheral group role allocation is better for: younger teachers vs. older teachers, female teachers vs. male teachers, and male sixth grade teachers vs. both male eleventh grade teachers and female sixth grade teachers.

Prediction in the reverse direction -- from communication structure to role allocation is not as fruitful except in the case of one specific sub-group, viz., female eleventh grade classes (Lambda = .212).

The explanation of these results can be discerned from Figure 7-44. It is apparent that the heavy concentration of frequencies down column 9 (peripheral$_1$ plus non-involveds) reduces the predictive potentiality of communication structure. There are, however, five role structures where approximately 50% of all incidents occur coincidentally with one particular communication structure. They are role structures 103 (teacher emitter, segment audience), 123 (teacher emitter, single student target, segment audience), 210 (student emitter, teacher target), 220 (student emitter, student target), 313 (segment emitter, teacher target, segment audience). All of these, except 220, load on communication structure #9 (peripheral$_1$ plus non-involveds). Role allocation 220 loads on #5 (central plus peripheral$_1$).

Figure 7-44. -- Coincidence Of Communication Structure And Role Allocation (Peripheral Group) For All Classrooms

CS Allocation	(1)	2	(3)	(4)	5	(6)	(7)	8	9	10	11	12	(13)	14	15	(0)	TOTAL
101																	
103		2			1				65			8		47			123
104									3					1			4
107																	
113									1					1			2
114																	
120		3			11			2	23		4			18	1		62
122									3					1			4
123		3			13			(5)	104		2	4		59	1		191
126		1						1	3					1			6
130		1						1									2
133					1				4					3			8
134																	
140																	
143																	
203					3				1			1					5
204					2												2
207																	
210		1			5			2	30			3		29	1		71
212									8					3			11
213		4		2	4			(5)	81	1	2	3		48			150
214					2			1	1								4
217																	
220	2	(8)			(476)			(5)	(136)		(107)	(160)	1	(80)	(52)		1035
224					2												2
226																	
227																	
241																	
253												1					1
254																	
304																	
306									1			2		4			7
307		2						2	2					1			7
313		2			1				21			3		18			45
314																	
324																	
326									1								1
327																	
353																	
410																	
413																	
504																	
603																	
604																	
700																	
703																	
(0)	823	1	4	322		134	328			85			35			51	1783
TOTAL	825	28	4	324	521	134	328	24	486	86	115	194	36	315	56	51	3526

Figure 7-43. -- Coincidence: Percentage Error Elimination For Communication Structure And Role Allocation (Peripheral Group₁)

Independent Variables	Relationship		
	RA1>CSS	CSS>RA1	RA1,CSS
All Classrooms	26%*	0%	16%
First Grade	17%*	0%	11%
Sixth Grade	11%*	7%	9%
Eleventh Grade	21%*	0%	13%
Mathematics	17%*	4%	11%
Social Studies	13%*	2%	10%
Younger Teachers	35%*	3%	22%
Older Teachers	14%*	0%	11%
Female Teachers	32%*	6%	20%
Male Teachers	14%*	0%	11%
Male Sixth Gr.	1%	0%	1%
Female Sixth Gr.	26%*	21%*	23%
Male Eleventh Gr.	27%*	0%	13%
Female Eleventh Gr.	12%	9%	11%

Figure 7-44. -- Independent Variable Coincidence Comparisons: Communication Structure And Role Allocation (Peripheral Group₁)

Independent Variables	z scores	
	RA>CSS	CSS>RA
1st vs. 6th	1.20	-0.85
6th vs. 11th	-2.12	0.82
1st vs. 11th	-0.61	0.00
Math vs. S.S.	1.06	0.22
-30 vs. +40	5.92 *	0.69
F vs. M	5.04 *	0.92
M 6th vs. 11th	-3.18 *	0.00
F 6th vs. 11th	1.37	0.45
6th M vs. F	-3.79 *	-1.23
11th M vs. F	1.08	-0.32

By definition, any communication structure relevant for the present discussion can only include structures in which peripheral groups exist. Consequently, the interesting characteristics of the data reside in the conditions associated with the peripheral group. It is noteworthy that if the teacher is involved in a peripheral group -- either as target or emitter -- there will be no coincidental central group but instead there will be a large number of non-involved students. If the teacher is not in the peripheral group then a central group will be in existence. It seems apparent that non-teacher dominated central groups and peripheral groups (teacher dominated or not) are incompatible.

Communication Structure and Role Structure in the Primary Peripheral Group

For all classrooms peripheral group role structure predicts significantly to communication structure but the reverse is not true. Knowing the existing role structure permits the elimination of 10% of the error in predicting which communication structure exists (Lambda = .104). However, there are a number of instances among the independent variable defined subsets when significance is achieved. There were five cases where significant Lambdas occurred and they operated in both directions. They were: sixth grade (19%* and 9%), mathematics classes (11% and 14%), younger teachers (16% and 17%), female teachers (18% and 19%), female sixth grade teachers (27% and 21%).

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*Communication Structure > Role Structure.

There were also three cases where significant Lambdas operating in both directions resulted from the subset comparisons. The results showed that prediction, no matter the direction, was better for: younger teachers vs. older teachers, female teachers vs. male teachers and female sixth grade teachers vs. male sixth grade teachers. There was better predictability for communication structure to role structure only in the case of sixth grade vs. eleventh grade classes.

An interpretation of Figure 7-47 encourages the following conclusions. If there is a two role system, comprising emitter and audience only, the most likely communication structure will consist of one or two peripheral groups plus non-involveds (83% of instances). If there is a two role system comprising emitter and target then the greatest likelihood is that there is a central system plus the peripheral group (#5). However, this accounts for only 42% of the frequencies. The remainder are spread relatively evenly across the other relevant role structures. If there is a three role system (emitter, target and audience) then it is most likely that a peripheral system plus non-involveds exist although two other systems run it a close second; viz., #5 (central plus peripheral) and #9 (peripheral plus non-involveds).

The table also shows a tendency for certain communication structures to be associated with certain role structures in the peripheral group. For example, if there is a central group as well as the peripheral one, by far the greatest likelihood is that there will be an emitter plus target only in the peripheral group. In the

Figure 7-47. -- Coincidence Of Communication Structure And Peripheral Group, Role Structure For All Cliques***

RS	1	2	3	4	5	(0)	TOTAL
CS							
(1)			1	2		(823)	826
(2)		4	12	13		1	30
(3)						4	4
(4)			2			322	324
(5)		8	121	(506)			635
(6)						134	134
(7)					1	328	329
8		2	11	10			23
9		(69)	(196)	193			458
(10)			1			85	86
(11)			50	124			174
(12)	(2)	11	61	173			247
(13)				1		35	36
(14)		49	133	124			306
(15)			31	56			87
(0)						51	51
TOT	2	143	619	1202	1	1783	3750

Figure 7-48. -- Coincidence: Percentage Error Elimination
For Communication Structure and Role Structure
(Peripheral Group$_1$)

Independent Variables	Relationship		
	CS>RS	RS>CS	CS,RS
All Classrooms	1%	10% *	7%
First Grade	0%	3%	1%
Sixth Grade	19% *	9% *	13%
Eleventh Grade	1%	0%	0%
Mathematics	11% *	11% *	11%
Social Studies	0%	2%	1%
Younger Teachers	15% *	17% *	16%
Older Teachers	1%	4%	3%
Female Teachers	18% *	20% *	19%
Male Teachers	1%	1%	1%
Male Sixth Gr.	1%	0%	0%
Female Sixth Gr.	27% *	22% *	24%
Male Eleventh Gr.	1%	0%	0%
Female Eleventh Gr.	9%	6%	7%

Figure 7-49. -- Independent Variable Coincidence Comparisons:
Communication Structure and Role Structure
(Peripheral Group$_1$)

Independent Variables	Z Scores	
	CS>RS	RS>CS
1st vs. 6th	-2.37	-1.25
6th vs. 11th	2.69 *	2.02
1st vs. 11th	-0.02	0.45
Math vs. S.S.	1.73	2.55
-30 vs. +40	2.64 *	3.98 *
F vs. M	2.98 *	5.63 *
M 6th vs. 11th	-0.02	0.00
F 6th vs. 11	1.19	1.85
6th M vs. F	-3.13 *	-3.70 *
11th M vs. F	-0.61	-0.67

case of the existence of peripheral group and non-involveds only, there is about an even chance that the role structure will consist of either an emitter, target and audience or emitter and target. In the cases where there is either a central group and two peripherals or a central group, one peripheral plus non-involveds, then it is most likely that there will be an emitter plus target in the primary peripheral group. The chances that there will be an emitter plus target plus audience are approximately half as great.

Collectively these interpretations do not lead to any clearly justified conclusions. However, there are several generalizations that can be advanced with some measure of justification. Associated with the absence of a central group is the likelihood that the peripheral group will be small (emitter plus target only). If there is a central group then there are two possibilities: either the peripheral group will be structured in a way that implies it is not officially sanctioned (i.e., it consists of emitter plus target only); or it will be structured in such a way that implies that the functioning of the peripheral group is impinging upon the central group in that not only has the peripheral group an emitter, target and audience -- the central group also has a number of non-involved actors.

Role Structure and Teacher Role Assignment

Teacher role assignment defines whether the teacher is emitter, target, or audience member and states as well whether he is in the central group, a peripheral group, or is non-involved. Knowing the role assigned to the teacher permits the elimination of a considerable amount of error in predicting the role structure in the central system

(Lambda = .450 or 45%). Predicting an association in the reverse direction is less sure but is still statistically significant (Lambda = .253 or 25%). In both cases all the subsets of classrooms defined by independent variables produce statistically significant Lambdas with one exception -- female sixth grade teachers.

Comparisons among the subsets reveal differences that indicate that in predicting role structure from teacher role assignment, prediction is significantly better for: first grade than sixth grade teachers; eleventh grade than sixth grade teachers; older teachers than younger teachers; and male teachers than female teachers. Prediction in either direction was better for: female eleventh grade teachers vs. female sixth grade teachers; for male sixth grade teachers vs. female sixth grade teachers; and, for female eleventh grade teachers vs. male eleventh grade teachers. Three scores revealed significant differences in predicting teacher role assignments from role structure: eleventh grade over first grade, social studies over mathematics classes and male sixth over male eleventh grades.

The distribution of loadings in Figure 7-50 provides a part explanation of these results. Most clear is the fact that an emitter plus audience role structure is linked clearly with the teacher as emitter in the central group (89% of instances). By contrast the teacher is likely to be an audience member but 11% of the time. If there is a three role system operating (emitter, target and audience) then precise prediction is less possible. The teacher will be either emitter or target (39% and 55% of all instances) but still

Figure 7-50. -- Coincidence Of Teacher Role Assignment And Role Structure (Central Group) For All Classrooms

RA	1	2	3	4	5	6	7	8	9	0	TOT
RS											
1			18	(12)	3	(3)				3	39
2	(1937)		(219)	10	(4)					9	2179
3	1033	(1496)	92	7						(21)	2649
4	38	50									88
5	10										10
(0)	1			184	154	16	1		1	423	780
TOT	3019	1546	329	213	161	19	1		1	456	5745

Figure 7-51. -- Coincidence: Percentage Error Elimination For Role Assignment and Role Structure (Central Group)

Independent Variables	Relationship		
	RS>RA	RA>RS	RA,RS
All Classrooms	25% *	45% *	36%
First Grade	21% *	47% *	35%
Sixth Grade	22% *	30% *	26%
Eleventh Grade	32% *	54% *	45%
Mathematics	12% *	43% *	30%
Social Studies	35% *	47% *	41%
Younger Teachers	25% *	40% *	33%
Older Teachers	26% *	50% *	39%
Female Teachers	24% *	42% *	33%
Male Teachers	27% *	49% *	40%
Male Sixth Gr.	43% *	50% *	47%
Female Sixth Gr.	1%	10%	5%
Male Eleventh Gr.	13% *	50% *	37%
Female Eleventh Gr.	71% *	71% *	71%

Figure 7-52. -- Independent Variable Coincidence Comparisons: Teacher Role Assignment and Role Structure (Central Group)

Independent Variables	Z scores	
	RS>TRA	TRA>RS
1st vs. 6th	-0.24	4.49 *
6th vs. 11th	-2.50	-7.03 *
1st vs. 11th	-2.64 *	-2.56
Math vs. S.S.	-6.74 *	-1.58
-30 vs. +40	-0.36	-3.74 *
F vs. M	-0.93	-2.78 *
M 6th vs. 11th	5.05 *	0.06
F 6th vs. 11th	-12.84 *	-10.15 *
6th M vs. F	7.65 *	6.92 *
11th M vs. F	-10.82 *	-4.99 *

rarely an audience member. It is again highly predictable that if the teacher is non-involved or out of the room there will be no role structure (93% of instances).*

The table also implies that if the teacher is emitter in the central group, then there is a two to one chance that there will be a two role system (E and A) rather than a three role one operating. If he is target in the central group (#3) then the likelihood that there will be a three role system is very high (97% of instances).

On the few occasions that he is an audience member, there is a two to one chance that the central group structure will consist of emitter plus audience only. If the teacher is at all involved in a peripheral group then it is likely that there will be no central group in existence (89% of instances).

When taken collectively these results also reinforce the impression that the teachers' participation in activities is a very direct and active one. Furthermore, the participation of others depends on him. When the teacher is involved in the central group then so is everyone else. When he is involved in a peripheral one then the others must wait for his return before the central system may again become operative.

Role Structure and Teacher Location

Prediction from teacher location to role structure is significant but weak (Lambda = .059 or 6%). Prediction for the subsets is similarly weak although significance is reached in all but four cases. Prediction in the reverse direction is not possible for the whole sample or for any of the subsets. None of the comparisons was significant either.

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*All data were collected between the recognizable beginning of the lesson and its end. These instances do not include instances of pre- and post-lesson informality.

The reason for the low level of error elimination is clear in Figure 7-53, where the catholic distribution of scores is apparent.

However, some interpretation of Figure 7-53 is possible. Most locations predict to either an emitter-audience role structure or an emitter-target-audience role structure. It is fairly obvious that the further away the teacher gets from the center front of the room (locations 24 and 25) the greater the likelihood that the odds will favor a three role system. The converse, of course, applies too.

To some extent then, these data seem to imply that the front of room locations encourage a kind of universalistic communication style and back of the room ones a more particularistic one.

Role Allocation and Emitter Location

Emitter locations and role allocation predict to each other significantly. Knowing the locations of the emitter permits the elimination of 31% of the error in predicting what pattern of role allocation exists (Lambda = .309). Knowing the prevailing role allocation permits the elimination of 19% of the error in predicting emitter locations. All Lambdas for all of the subsets are significant. Two Lambdas topped 50%. They predicted from emitter locations to role allocation. They were Lambda = .609 for female eleventh grade teachers and Lambda = .501 for sixth grade.

Figure 7-53. -- Coincidence of Teacher Location and Role Structure (Central Group) For All Classrooms

Structure	1	2	3	4	5	0	TOT
Location							
11	(15)	249	98	2	(10)	(378)	752
12							
13							
14							
15							
16							
21		2	1				3
22		3	5				8
23		95	64	2		1	162
24	2	(1605)	(1497)	(59)		77	3240
25	1	201	132	1		13	348
26		12	10	1		4	27
31							
32		48	33			2	83
33		15	30	2		12	59
34		126	156	9		48	339
35		17	23	3		4	47
36		108	84	2		3	197
41							
42		16	16	2		1	35
43		59	66	4		7	136
44		91	92	4		18	205
45		53	70	1		8	132
46		32	33			2	67
51							
52	9	14	15				38
53		7	2			4	13
54		46	107	1		23	177
55		5	17	1		9	32
56		13	15			5	33
61							
62							
63		3	1				4
64		8	7			6	21
65		2	6			6	14
66		1	2				3
99							
(0)	2	23	30	1		79	135
TOT	29	2854	2612	95	10	710	6310

Figure 7-54. -- Coincidence: Percentage Error Elimination For Teacher Location and Role Structure (Central Group)

Independent Variables	Relationship		
	TL>RS	RS>TL	TL,RS
All Classrooms	6% *	1%	4%
First Grade	3%	1%	2%
Sixth Grade	5%	1%	3%
Eleventh Grade	7% *	0%	4%
Mathematics	9% *	1%	5%
Social Studies	4%	1%	2%
Younger Teachers	9% *	1%	5%
Older Teachers	6% *	1%	4%
Female Teachers	6% *	1%	4%
Male Teachers	10% *	1%	6%
Male Sixth Gr.	10% *	2%	6%
Female Sixth Gr.	1%	0%	0%
Male Eleventh Gr.	10% *	0%	6%
Female Eleventh Gr.	8%	0%	6%

The independent variable defined comparisons yielded three significant differences operating in both directions. Significantly better prediction is possible for female eleventh grade teachers rather than female sixth grade teachers and for female eleventh grade teachers rather than male eleventh grade teachers. The third case is not symmetrical; better prediction is possible for male rather than females in the case of predicting emitter locations from role allocation, while in the other direction the significant difference favors females. Only one other significant difference in the role allocation to emitter location direction was achieved. Grade one predicts significantly better than grade six. The remaining significant differences for predicting role allocation from emitter location are: eleventh grade is better than sixth grade and better than first grade; social studies classes are better than mathematics classes; male eleventh grade is better than male sixth grade; and male sixth grade is better than female sixth grade.

Figure 7-55 provides some leads for the further interpretation of the data. It is noticeable that all role allocations where the teacher is emitter load heavily on center front locations (24 particularly, and 25). The other center line locations account for the bulk of occasions when a single student is emitter. In all cases where there are multiple emitters, only one location is identified, 11 (diffuse-diffuse). If there is no identifiable target, again the center front locations predominate. If the teacher is the target then center line locations from the middle of the room back (33, 34, 35, 43, 44, 45, 53, 54, 55) account for the most instances.

Figure 7-55. -- Coincidence Of Role Allocation And Emitter Location (Central Group) For All Classrooms

Location	11	12	13	14	15	16	21	22	23	24	25	86	31	32	33
Allocation															
101										1	1				
103								1	9	106	6	2		18	5
104								(2)	(90)	(1511)	(188)	(10)		(30)	9
107											1				
113											1				
114											1	1			
120										10					2
122										2					1
123									5	65	5	1		1	7
124									23	591	58	2		13	4
130										3					
133									2	14					1
134									3	17	4			1	
140										7	1				
143										2					
203										2					
204										7					
207									3	135	2				4
210										22	1	1			2
212										14					2
213										23	2				7
214	2								2	47	7	1		2	(128)
217										1					
220															
224															1
226															
227										10					12
241										2	4				
253										1					
254										1					1
304	1														
306	3														
307	2														
313	(157)														
314	124				(1)										
324	4														
326	5														
327	11									1					
353	3														
410	18														
413	9														
504	5									1					
603	21														
604	12														
700	10														
703	2														
(0)															
TOTAL	396				1			3	137	2596	282	18		65	186

(Continued on next page)

Figure 7-55. (Continued)

Location	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
Allocation															
101															
103	20	5	7		(12)	6	28	2	6		(11)		7		2
104	106	12	(100)		4	55	63	52	(25)		3	6	38	4	(11)
107	1														
113		1						1							
114															
120	5	3			1	3	1						1		
122	1						1								
123	17	2	2		5	5	17	4	3		7	1	3	1	2
124	59	7	49		5	13	30	24	13				90	6	9
130														1	
133	2					1	4				1		3		
134	3		1				1							1	
140	2														
143															
203							1								
204	1	1				1	1		1			1	4	1	
207	15	2				2	10	4	10			1	20	5	
210	2					1	1	1							
212															
213	49	5				3	21	3	1			6	20		
214	(354)	(76)	4		1	(100)	(259)	(71)	7			(42)	(125)	(76)	
217						(1)									
220															
224	4					2	7		1			2	4		
226	2						1								
227	22					12	9	2	6			18	6	10	
241															
253															
254															
304															
306															
307															
313	1														
314	1	2										1	1		
324															
326															
327															
353															
410															
413															
504															
603	1														
604															
700															
703															
(0)															
TOTAL	663	116	163		28	205	455	164	73		22	78	322	105	24

(Continued on next page)

Figure 7-55. (Continued)

Location	61	62	63	64	65	66	99	(0)	TOT
Allocation									
101									2
103				1					254
104			(2)	(7)	2	1	2		2333
107									2
113									3
114							1		3
120							1		27
122									5
123				1		1			155
124			1	3	(4)	1	1		1006
130									4
133									28
134					1				32
140									10
143									2
203									3
204									18
207							3		216
210							2		33
212									16
213					2	1	19		162
214							(167)	1	1472
217									2
220									
224					2				23
226									3
227				1	1	1	6		116
241									6
253									1
254							3		5
304									1
306									3
307									2
313								1	159
314							1		131
324									4
326									5
327									12
353									3
410									18
413									9
504									6
603									22
604									12
700									10
703									9
0								334	334
TOT			3	13	12	5	206	336	6682

Figure 7-56. -- Coincidence: Percentage Error Elimination For Role Allocation and Emitter Location (Central Group)

Independent Variables	Relationship		
	RA>EL	EL>RA	RA,EL
All Classrooms	19% *	31% *	25%
First Grade	25% *	26% *	26%
Sixth Grade	16% *	25% *	20%
Eleventh Grade	20% *	50% *	35%
Mathematics	18% *	28% *	23%
Social Studies	21% *	35% *	28%
Younger Teachers	17% *	35% *	26%
Older Teachers	21% *	33% *	28%
Female Teachers	22% *	29% *	26%
Male Teachers	16% *	35% *	26%
Male Sixth Gr.	17% *	37% *	27%
Female Sixth Gr.	17% *	26% *	21%
Male Eleventh Gr.	17% *	49% *	33%
Female Eleventh Gr.	29% *	61% *	45%

Figure 7-57. -- Independent Variable Coincidence Comparisons Role Allocation And Emitter Location (Central Group)

Independent Variables	z scores	
	RA EL	EL RA
1st vs. 6th	3.63 *	0.61
6th vs. 11th	-1.68	-11.09 *
1st vs. 11th	1.83	-9.93 *
Math vs. S.S.	-1.26	-3.98 *
-30 vs. +40	-1.94	0.83
F vs. M	2.73 *	-2.96 *
M 6th vs. 11th	-0.02	-4.01 *
F 6th vs. 11th	-2.75 *	-9.21 *
6th M vs. F	-0.02	3.54 *
11th M vs. F	-2.76 *	-3.43 *

When the pattern of distribution down the columns (locations) is examined, the picture revealed is to some extent a mirror image of the row (role allocation) data. For example, location 11 predicts inevitably to a role allocation with multiple emitters, irrespective of the character of target or audience. Location 24 (and to a lesser extent, 25) predicts either to role allocation patterns in which the teacher is emitter or in which there is a single pupil emitter and no audience.

Locations 33, 34 and 35 are a little less straightforward. If the emitter is located in the middle of the room then the greatest likelihood is that there will be a single student emitter, a teacher target, and a segment or quorum audience. It is next most likely that the same pattern will exist without a target and third most likely that there will be a teacher emitter, single pupil target, and a segment or quorum audience. Precisely the same set of ranking holds for the center back locations (43, 44, 45). For locations (53, 54, 55) the second and third ranked role allocations change places.

The extent to which these patterns are clear cut is perhaps the most striking outcome of this analysis. It is apparent that the emitter is usually located in the center front and that he is usually the teacher. However, the teacher as a center front emitter selects different kinds of targets, although he invariably demands a large audience. On the other hand, pupil center front emitters select no target but rather "deliver" to the whole class. The extent to which emitters are combined within the narrow belt up the center of the room is again most apparent in the data.

Role Allocation and Target Locations

Knowing the location of the target permits the elimination of 34% of the error in predicting the pattern of role allocation pertaining. The Lambda of .344 is significant and so are all the Lambdas for all the subsets. The independent variable based comparisons show significant differences that favor: eleventh grade over sixth grade; eleventh grade over first grade; and male eleventh grade over male sixth grade and over female eleventh grade teachers.

Role allocation predicts far less well to target location although the resulting Lambda of .046, or 5% reduction of error, is significant. All the subset Lambdas are significant except four (mathematics classes, older teachers, male teachers, and male eleventh grade teachers). None of the independent variable comparisons is significant.

Figure 7-58, from which interpretations of the data may be made, shows some similarities with the previous section in emitter location. Again, the majority of target locations occur in the center front of the room. As well, there is a band of locations up the middle of the room that accomodates almost all the remaining instances.

These two prevailing patterns tend to be associated with patterns of role allocations also. The two most distinctive patterns have either the teacher as an emitter and a single pupil as target, or a single pupil as target and teacher as emitter. A third pattern is associated with center front target locations only and occurs when there are multiple emitters.

Figure 7-58. -- Coincidence Of Role Allocation And Target Location (Central Group) For All Classrooms

Location	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
Allocation															
101															
103															
104	4								1			1		1	
107															
113											1				
114												1			
120										3					2
122	1									2					1
123									4	29	1				8
124									6	175	10	1	(1)	2	(69)
130	2									1					
133	8	1	(3)	(3)	(1)		(2)		1	6	2				
134	(18)	1		1	(1)				1						1
140	10														
143	2														
203															
204															
207										2					
210									1	26	1	1			
212										15					1
213								1	2	75	4	1		6	3
214							1	(3)	(29)	(887)	(70)	(6)	(1)	(21)	9
217										1					
220															
224										5				1	
226															1
227										15					14
241	6														
253										1					
254	1									4					
304															
306															
307															
313									3	111	5			2	
314									5	89	19				
324										4					
326										3					
327	1									4					
353										3					
410									1	14					
413										7	2				
504															
603															
604															
700															
703															
0															
TOTAL	53	2	3	4	2		3	4	54	1482	115	11	2	33	109

(Continued on next page)

Figure 7-58. (Continued)

Location	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
Allocation															
101															
103															
104	1						2	1					1		
107															
113								2							
114			1												
120	7	3				2	2	2					1		
122	1	1													
123	32	13	2		1	6	21	2	1			3	10	2	
124	(205)	(58)	3		4	(54)	(188)	32	(17)			(20)	(125)	(37)	3
130			1												
133														2	
134		3		(1)			1		1					1	
140															
143															
203															
204	1														
207															
210	2				2	1	2	1							
212															
213	15	3	1		(6)	4	17		3		(8)		1		
214	59	10	(40)		2	33	25	(51)	(17)		1	1	24	3	8
217															
220															
224	5	1	2		1								5	2	
226	2														
227	16	1				7	10	2	3			9	11	13	
241															
253															
254															
304															
306															
307															
313	6				2	18	4	2	2		4		1		(2)
314	4		1			1	4	1					7	1	1
324															
326	1						1								
327	3							1						3	
353															
410			2				1								
413															
504															
603															
604															
700															
703															
0															
TOTAL	360	93	53	1	18	126	278	97	44		13	33	186	64	14

(Continued on next page

Figure 7-58. (Continued)

Location	61	62	63	64	65	66	99	0	TOT
Allocation									
101								2	2
103								165	165
104							3	1813	1828
107								2	2
113									3
114							1		3
120							2		24
122									6
123		(1)		1	2		15	2	156
124				(5)	(4)		(73)	3	1095
130									4
133									29
134					1				31
140									10
143									2
203								3	3
204								17	18
207								210	212
210									37
212									16
213				1	1		1		153
214				2			1		1304
217								1	2
220									
224								1	23
226									3
227			(1)		1		3		106
241									6
253									1
254									5
304								1	1
306								3	3
307								2	2
313									162
314									133
324									4
326									5
327									12
353									3
410									18
413									9
504								6	6
603								22	22
604								12	12
700								10	10
703								9	9
0								334	334
TOT		1	1	9	9		99	2618	5994

Figure 7-59. -- Coincidence: Percentage Error Elimination For Role Allocation and Target Location (Central Group)

Independent Variables	Relationship		
	RA>TL	TL>RA	RA,TL
All Classrooms	5% *	34% *	20%
First Grade	8% *	30% *	20%
Sixth Grade	7% *	23% *	15%
Eleventh Grade	8% *	59% *	35%
Mathematics	5%	38% *	23%
Social Studies	6% *	33% *	20%
Younger Teachers	8% *	37% *	22%
Older Teachers	3%	35% *	21%
Female Teachers	6% *	34% *	21%
Male Teachers	4%	39% *	22%
Male Sixth Gr.	10% *	28% *	19%
Female Sixth Gr.	13% *	29% *	20%
Male Eleventh Gr.	7%	63% *	36%
Female Eleventh Gr.	23% *	41% *	33%

Figure 7-60. -- Independent Variable Coincidence Comparisons Role Allocation and Target Location (Central Group)

Independent Variables	Z Scores	
	RA>TL	TL>RA
1st vs. 6th	-0.40	2.06
6th vs. 11th	-0.35	-11.14 *
1st vs. 11th	0.03	-8.58 *
Math vs. S.S.	-0.26	1.88
-30 vs. +40	1.58	0.82
F vs. M	0.69	-1.64
M 6th vs. 11th	0.73	-8.92 *
F 6th vs. 11th	-1.78	-1.59
6th M vs. F	-0.74	-0.14
11th M vs. F	-1.81	3.14 *

Targets then conform to a pattern that implies that the operative part of the classroom is the center band delimited earlier. The data also indicate that structural patterns of a discernable character tend to recur with considerable regularity. The data also suggest interaction among the members is far from equitable. The teacher is repeatedly a dominant participant.

Role Allocation and Audience Location

Role allocation predicts significantly to audience location (Lambda = .337 or 34%), but no significance results when the direction is reversed. There are six independent variable subsets that achieve significance. They are: sixth grade, mathematics classes, younger teachers, male teachers, male sixth grade teachers, and female sixth grade teachers.* The only comparison to achieve significance showed that sixth grade classes with female teachers predict to audience location better than do sixth grade classes with male teachers.

The clustering of results in Figure 7-61 shows that all role allocations of any magnitude predict to location 11 (diffuse - diffuse). There are some exceptions to this pattern, but they are not of sufficient size to warrant discussion.

Obviously, the finding is partly artifact of the analysis system. If an audience is large it must be coded 11. However, the audience does not need to be large, and the fact that so few instances of small audiences were recorded testifies strongly to the tendency for classroom interaction to be both public and whole group oriented.

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*Note that in female sixth grade classrooms, all entries for audience location and role allocation appeared in a single cell.

Figure 7-61. -- Coincidence Of Role Allocation And Audience Location (Central Group) For All Classrooms

Location	11	22	24	25	33	34	35	46	54	61	99	(0)	Total
Allocation													
101	2												2
103	166	(1)											167
104	1817		1		1			(1)		(1)		5	1826
107	2												2
113	2			1									3
114	2												2
120	2											21	23
122			3		(1)							1	5
123	121		4				1						126
124	886			1								2	889
130												4	4
133	28												28
134	31												31
140												10	10
143	1		1										2
203	3												3
204	18												18
207	212												212
210	1											29	30
212	1		(14)		(1)								16
213	119		11			(1)	(1)						132
214	1182		1								(1)	2	1186
217	2												2
220													0
224	20												20
226	3												3
227	81												81
241				(4)					(2)				6
253	1												1
254	5												5
304	1												1
306	3												3
307	2												2
313	156											2	158
314	131												131
324	4												4
326	5												5
327	12												12
353	3												3
410	2											16	18
413	9												9
504	6												6
603	22												22
604	12												12
700												10	10
703	9												9
(0)												334	334
TOT	5085	1	35	6	3	1	2	1	2	1	1	436	5574

Figure 7-62. -- Coincidence: Percentage Error Elimination For Role Allocation and Audience Location (Control Group)

Independent Variables	Relationship		
	RA>AL	AL>RA	RA,AL
All Classrooms	38% *	1%	1%
First Grade	56%	1%	1%
Sixth Grade	46% *	1%	2%
Eleventh Grade	38%	1%	1%
Mathematics	41% *	1%	2%
Social Studies	44%	0%	1%
Younger Teachers	44% *	1%	3%
Older Teachers	20%	0%	0%
Female Teachers	35%	1%	1%
Male Teachers	42% *	1%	2%
Male Sixth Gr.	42% *	2%	4%
Female Sixth Gr.	100% *	0%	1%
Male Eleventh Gr.	50%	1%	1%
Female Eleventh Gr.	17%	1%	2%

Figure 7-63. -- Independent Variable Coincidence Comparisons Role Allocation and Audience Location (Control Group)

Independent Variables	z scores	
	RA>AL	AL>RA
1st vs. 6th	0.35	-0.27
6th vs. 11th	0.37	0.28
1st vs. 11th	0.61	0.02
Math vs. S.S.	-0.14	0.30
-30 vs. +40	0.57	0.65
F vs. M	-0.27	-0.26
M 6th vs. 11th	-0.29	0.47
F 6th vs. 11th	2.25	-0.17
6th M vs. F	-3.91 *	0.51
11th M vs. F	0.77	-0.14

Figure 7-64. -- Coincidence of Teacher Role Assignment and Central Group Role Allocation For All Classrooms

Assignment Allocation	1	2	3	4	5	6	7	8	9	0	TOT
101	2										2
103	166	1									167
104	(1817)									2	1819
107	2										2
113	3										3
114	2										2
120	23										23
122	5										5
123	125										125
124	890									1	891
130	4										4
133	28										28
134	32										32
140	10										10
143	2										2
203				1	2						3
204				9	3					6	18
207			(212)								212
210		30									30
212		16									16
213		131								1	132
214		(1180)								1	1181
217		2									2
220											
224				6						(14)	20
226			3								3
227			81								81
241			6								6
253		1									1
254		5									5
304										1	1
306			3								3
307			2								2
313		159									159
314		131									131
324										4	4
326			5								5
327			12								12
353		3									3
410		18									18
413		9									9
504	6										6
603	22										22
604	12										12
700	10										10
703	9										9
(0)				(184)	(154)	(16)	(1)		(1)	423	779
TOT	3170	1681	324	200	159	16	1		1	453	6010

Role Allocation and Teacher Role Assignment

Predicting from role allocation to teacher role assignment yields a largely spurious Lambda result since the relationships are definitional. For example, role allocation patterns 101 through 143 specify the teacher as the emitter. As the current analysis is confined to the central group, it follows then that all correctly coded events indicating a role allocation of 101 through 143 will indicate that the teacher is central group emitter (code #1).

It is, consequently, more appropriate to consider how teacher role assignment predicts to role allocation. For example, if the teacher is emitter of the central group, it is still an open question which of the role allocation patterns which specify the teacher as the emitter is in existence. Nonetheless, there is still a degree of built-in dependency since if the teacher is assigned, e.g. to the role of emitter, then obviously a role allocation pattern cannot exist in which the teacher is allocated the role of the target or audience.

For several role allocation patterns the teacher role assignment is free to vary to some extent. Inevitably this variation coexists in the alternative non-central group roles he may adopt. Regretably the instances when the teacher is not involved in the central group are relatively few. Consequently an attempt at interpreting to small number of frequencies is not warranted.

For each teacher role assignment, role allocation patterns are free to vary to some extent. If the teacher is the central group emitter (code #1), then the teacher-emitter, quorum-audience pattern of roles (code #104) is most likely. If the teacher is the central group target (code #2), then the pupil-emitter, teacher-target, quorum audience pattern (code #214) is most likely. If the teacher is assigned a role in a peripheral group (codes 4, 5, 6, 7, 9), then most frequently no central group role allocation exists (code #0 row). If the teacher is non-involved, (code #0 column), but central group roles are allocated, then the pupil-emitter, pupil-target, quorum-audience pattern (code #224) exists most frequently.

These interpretations reinforce the earlier findings which explained the central part played by teachers in the classroom interaction process.

Role Allocation and Teacher Location

Role allocation predicts more strongly to teacher location than vice versa. Knowledge of the roles allocated permits the elimination of 14% of the error in predicting the location of the teacher (Lambda = .140). Knowledge of teacher location permits the elimination of 7% of the error in predicting the pattern of role allocation (Lambda = .074). Both results are significant, and all but female eleventh grade classes achieve significance in both functions.

The comparisons yield only one significant difference for predicting role allocation from teacher location. This difference favors female sixth grade teachers over female eleventh grade teachers. The three significant differences resulting from comparing predictability in the reverse direction favors, respectively: social studies classes over mathematics classes; female teachers over male teachers; and female sixth grade teachers over male sixth grade teachers.

Figure 7-65 shows clearly that the majority of role assignment categories predict to location 24. There are, however, three discernible patterns when the secondary and tertiary loadings are taken into consideration. The one accounting for most instances has already been referred to earlier as the center band pattern. It tends to be associated with role structures where: (i) the teacher is the emitter and there is a multiple audience and no target at all; (ii) when the teacher is the emitter and there is a single pupil target and a multiple audience; (iii) when the audience characteristics are the same as the preceding case but the emitter and target roles are reversed; and (iv) (but less clearly) when there is an emitting segment and the teacher is the target.

The locations themselves also generate patterns. The teacher is more likely to be located diffusely (#11) when role allocation 207 (single pupil emitter, no target and teacher plus quorum audience) is in existence. Location 24 predicts to a great many role allocations but loads most heavily on 104 (teacher emitter, quorum audience) and 214 (teacher emitter, single pupil target and quorum audience). The middle of the room locations 34, 35, 36, and 43, 44 and (nearly) 45 follow a similar pattern that reports the teacher located there in the 104, 214 and 124 role allocation situations. Location 54 (center back), however, tends to be associated with the 124 pattern most.

Figure 7-65. -- Coincidence Of Role Allocation And Teacher Location (Central Group) For All Classrooms

Location	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33	34	35	36
Allocation																		
101										1	1							
103	1						(1)	1	9	104	6	2		18	5	20	4	7
104	5						(1)	2	(89)	(1503)	(191)	(10)		(30)	9	(103)	(13)	(100)
107											1					1		
113											1						1	
114											1	1						
120										10					2	5	3	
122										2					1	1		
123									5	65	5	1		1	7	18	2	2
124	5							1	24	588	58	2		13	5	57	7	49
130										3								
133									2	14					1	2		
134									4	17	4			1		2		1
140										7	1					2		
143										2								
203										1	1					1		
204	1									2	2				1	2		1
207	(201)									10								
210									1	26		1				2		
212	1									15					1			
213								1	2	76	4	1		6	3	17	3	1
214	2						(1)	(3)	28	860	70	6		21	(13)	65	12	33
217	1									1								
220																		
224	1														1	2		1
226	3																	
227	79									1								
241											4							
253										1								
254	2									2	1							
304																		
306	3																	
307	2																	
313									3	111	5			2		6		
314									5	90	19					3		1
324	1									1								
326	5																	
327	12																	
353										3								
410									1	14								2
413										7	2							
504	5									1								
603	21															1		
604	12																	
700	10																	
703	9																	
(0)	378								1	76	13	4		2	12	48	4	3
TOT	760						3	8	174	3614	390	28		94	61	358	49	201

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Figure 7-65. (Continued)

Location Allocation	41	42	43	44	45	46	51	52	53	54	55	56	61	62	63	64	65	66	99	(0)	TOTAL
101																					2
103		(12)	6	27	2	6		(11)		7		2				1				1	253
104		4	(55)	(63)	51	(25)		3	(6)	38	4	(11)			(2)	(7)	2	(1)		112	2339
107																					2
113					1																3
114																				1	3
120		1	3	1						1										1	27
122				1																	5
123		5	5	17	4	3		7	1	3	1	2				1		(1)			156
124		5	12	28	24	13				(87)	6	9			1	3	(4)	(1)		9	1011
130											1										4
133			1	4				1		3											28
134				1							1						1				32
140																					10
143																					2
203																					3
204				3		1			1	2	1				1					6	24
207																				4	215
210		1	1	2	1																35
212																					17
213		6	4	14		2		8		2						1	2			3	156
214		2	35	39	(57)	17		1	1	23	(11)	8				2				2	1312
217																					2
220																					
224				1						3										13	22
226																					3
227										1										1	82
241										2											6
253																					1
254																					5
304																				1	1
306																					3
307																					2
313		2	18	4	2	2		4		1		2									162
314			1	4	1					7	1	1									133
324																				2	4
326																					5
327																					12
353																					3
410				1																	18
413																					9
504																					6
603																					22
604																					12
700																					10
703																					9
(0)		1	7	18	8	2			4	23	9	5				6	6			79	709
TOT		39	148	228	151	71		35	13	203	35	40			4	21	15	3		134	6880

Figure 7-66. -- Coincidence: Percentage Error Elimination For Role Allocation and Teacher Location (Central Group)

Independent Variables	Relationship		
	RA>TL	TL>RA	RA,TL
All Classrooms	14%*	7%*	10%
First Grade	19%*	6%*	11%
Sixth Grade	14%*	9%*	11%
Eleventh Grade	10%*	10%*	10%
Mathematics	9%*	8%*	9%
Social Studies	19%*	7%*	12%
Younger Teachers	12%*	6%*	8%
Older Teachers	17%*	11%*	13%
Female Teachers	21%*	7%*	12%
Male Teachers	7%*	10%*	8%
Male Sixth Gr.	8%*	13%*	11%
Female Sixth Gr.	29%*	17%*	22%
Male Eleventh Gr.	12%*	14%*	13%
Female Eleventh Gr.	4%	4%	4%

Figure 7-67. -- Independent Variable Coincidence Comparisons Role Allocation and Teacher Location (Central Group)

Independent Variables	z scores	
	RA>TL	TL>RA
1st vs. 6th	1.49	-1.13
6th vs. 11th	0.94	-0.23
1st vs. 11th	2.03	-1.27
Math vs. S.S.	-3.32 *	0.58
-30 vs. +40	-1.84	-2.34
F vs. M	4.88 *	-1.54
M 6th vs. 11th	-0.93	-0.13
F 6th vs. 11th	2.51	2.75 *
6th M vs. F	-5.66 *	-1.10
11th M vs. F	0.74	2.11

The implications of these interpretations are firstly that whether emitter or target, the teacher tends to occupy location 24 most. When he does so, the prevailing interaction is a "public" one. The teachers' venturing away from the center front of the room is associated, however, with the likelihood that if the teacher is still emitter, there will be a specific single student target. If he is not emitter, he is likely to be target and there will be a single pupil emitter. If the teacher ever gets to the back of the room, he will more often be an emitter with a single pupil as his target and with the rest of the class again comprising the audience.

Teacher Role Assignment and Emitter Location

Emitter location predicts much more strongly to teacher role assignment then vice versa. Knowledge of the location of the central group emitter, permits the elimination of 49% of the error in predicting teacher role assignment (Lambda = .492).

By contrast, prediction in the reverse direction produces a Lambda of .092 or 9%. However, in both cases all the independent variable defined subsets produce significant Lambdas.

The comparison undertaken produced two both-way statistically significant differences. Eleventh grade classes permit significantly better predictions than do sixth grade, eleventh grade classes with female teachers predict better than do sixth grade classes with female teachers. When prediction is made from emitter location to teacher role assignment, greater predictive power is shown to exist in: eleventh grade classes than in first grade classes; among male teachers than female teachers; and male sixth grade teachers than female sixth grade teachers.

The general impression given by Figure 7-68, which exemplifies matrices from which the findings were derived, is that only three teacher role assignments are particularly relevant. They are, of course, emitter, target, and audience-member in the central system. Not surprising, this order is a rank order of frequency of occurrence, too.

The reason for the high, predictive power of location to role assignment lies in the concentration of frequencies in the cell defined by location 24 and emitter role assignment. The data do, however, point to some interpretations not made earlier. When the teacher is an emitter he is most likely to be in the front of the room or in the center band. However, when he is the target, the emitters are more likely to be in the center band. Further, when the teacher is an audience member the emitter is more likely to occupy the front of the room.

It is clear that not only does the teacher treat the front of the room and the center band as favored locations, but pupil emitters are characteristically to be found here also.

Teacher Role Assignment and Target Location

Central group target location predicts much more strongly to teacher role assignment than vice versa. Knowledge of the location of the central group target permits the elimination of 52% of the error in predicting teacher role assignment (Lambda = .519). This result is significant. Knowing teacher role assignment permits the elimination of only about 2% of the errors in predicting target location ($\text{Lambda}_{TRA>CGTL} = .016$) for all classrooms. This predictive association

Figure 7-68. -- Coincidence Of Teacher Role Assignment And Emitter Location (Central Group) For All Classrooms

Location Assignment	11	12	13	14	15	16	21	22	23	24	25	26	31	32	33
1	55							3	112	(1534)	240	16		52	27
2	304				1				2	85	10	2		2	139
3	24								4	(144)	5				17
4	1														1
5										(2)					
6															
7															
8															
9															
0	5									(8)					
TOT	389				1			3	118	1773	255	18		54	184

Location Assignment	34	35	36	41	42	43	44	45	46	51	52	53	54	55	56
1	181	26	120		26	69	115	64	42		19	7	119	12	15
2	(401)	82	4		1	105	281	75	8			47	145	76	
3	35	2				13	18	6	16			19	25	14	
4	2	1				1	1		1			3	(4)	1	
5							1						1		
6															
7															
8															
9															
0	3					2	7	1	1			1	3		
TOT	622	111	124		27	190	423	146	68		19	77	297	103	15

Location Assignment	61	62	63	64	65	66	99	0	TOT
1			3	12	6	3	4		2882
2					2	1	191	2	1966
3				1	1	1	9	18	372
4					1			196	213
5								157	161
6								19	19
7								1	1
8									
9								1	1
0					1		1	426	459
TOT			3	13	11	5	205	820	6074

Figure 7-69. -- Coincidence: Percentage Error Elimination For Teacher Role Assignment and Central Group Emitter Location

Independent Variables	Relationship		
	RA>EL	EL>RA	RA, EL
All Classrooms	9% *	49% *	25%
First Grade	13% *	40% *	24%
Sixth Grade	7% *	45% *	22%
Eleventh Grade	15% *	71% *	30%
Mathematics	11% *	43% *	25%
Social Studies	9% *	53% *	27%
Younger Teachers	7% *	49% *	24%
Older Teachers	11% *	51% *	28%
Female Teachers	10% *	42% *	23%
Male Teachers	11% *	62% *	31%
Male Sixth Gr.	7% *	71% *	30%
Female Sixth Gr.	9% *	30% *	17%
Male Eleventh Gr.	13% *	71% *	36%
Female Eleventh Gr.	22% *	76% *	46%

Figure 7-70. -- Independent Variable Coincidence Comparisons Teacher Role Assignment and Central Group Emitter Location

Independent Variables	z scores	
	TRA>EL	EL>TRA
1st vs. 6th	2.52	-1.52
6th vs. 11th	-3.39 *	-3.91 *
1st vs. 11th	-0.68	-10.23 *
Math vs. S.S.	0.87	-1.76
-30 vs. +40	-1.99	-0.52
F vs. M	-0.48	-7.78 *
M 6th vs. 11th	-1.77	0.10
F 6th vs. 11th	-3.10 *	-10.61 *
6th M vs. F	-0.36	9.60 *
11th M vs. F	-2.14	-1.63

is insignificant. However, the Lambdas computed from sixth grade classroom and female sixth grade classroom data allow one to eliminate 5% and 9% of error, respectively, in predicting target location from knowledge of teacher role assignment (Lambdas = .048 and .091, respectively). All the subset Lambdas predicting from teacher location to role assignment were significant. So were all but two of the subset comparisons. These comparisons favored: grade one over grade six; grade eleven over grade six; and grade eleven over grade one; mathematics over social studies; male teachers over female teachers; eleventh grade male teachers over sixth grade males; eleventh grade female teachers over sixth grade females; and sixth grade female teachers over sixth grade male teachers.

The pattern of frequency distribution shows that the target tends to be located either in the center front of the room or up the center band. This is particularly true if the target is the teacher. If the teacher is the emitter then the center band preempts the front of the room location. It is also apparent that when the teacher is the emitter targets tend to be located more diffusely throughout the class, although the peripheral locations are relatively deprived. On the few occasions when the teacher is an audience member the center front-center band pattern operates.

The locations themselves produce some distinctive patterns. If the targets are diffuse (#11) then the teacher is most likely to be the emitter in the central group. If the target is at 24, the target is most likely the teacher. If the target is at 34, 44, 54, or 64, then the emitter is most likely the teacher.

Figure 7-71. -- Coincidence of Teacher Role Assignment and Central Group Target Location For All Classrooms

Location	11	12	13	14	15	21	22	23	24	25	26	31
Assignment												
1	(44)	(2)	(3)	(4)	(2)	(2)		10	213	14	3	(1)
2	4					1	(4)	(40)	(1116)	(89)	(8)	(1)
3	8								23			
4									1			
5												
6												
7												
8												
9												
0									10			
TOT	56	2	3	4	2	3	4	50	1363	103	11	2

Location	32	33	34	35	36	41	42	43	44	45	46	52
Assignment												
1	3	(80)	(240)	(77)	7	(1)	5	(61)	(212)	38	19	
2	(29)	13	82	12	(44)		(12)	50	49	(53)	(22)	(9)
3		15	18	1				7	11	3	3	
4			3	2								
5												
6												
7												
8												
9												
0	1		3		2		1					
TOT	33	108	346	92	53	1	18	118	272	94	44	9

Location	53	54	55	56	62	63	64	65	99	(0)	TOT
Assignment											
1	(23)	(135)	(41)	3	(1)		(6)	(6)	(90)	1922	3268
2	1	28	3	(11)			3	1	2	2	1689
3	9	11	15			(1)		1	3	235	364
4			2							205	213
5										160	160
6										19	19
7										1	1
8											
9										1	1
0		7								434	458
TOT	33	181	61	14	1	1	9	8	95	2979	6173

Figure 7-72. -- Coincidence: Percentage Error Elimination For Teacher Role Assignment and Central Group Target Location

Independent Variables	Relationship		
	RA>TL	T L>RA	RA, TL
All Classrooms	2%	52% *	24%
First Grade		56% *	27%
Sixth Grade	5% *	40% *	19%
Eleventh Grade	5%	73% *	38%
Mathematics	1%	62% *	29%
Social Studies	2%	48% *	22%
Younger Teachers	4%	56% *	26%
Older Teachers	1%	54%*	26%
Female Teachers	1%	50% *	24%
Male Teachers	2%	62% *	28%
Male Sixth Gr.	1%	52% *	18%
Female Sixth Gr.	9% *	35% *	20%
Male Eleventh Gr.	5%	74% *	38%
Female Eleventh	16%	69% *	41%

Figure 7-73. -- Independent Variable Coincidence Comparisons Teacher Role Assignment and Central Group Target Location

Independent Variables	z scores	
	TRA>TL	TL>TRA
1st vs. 6th	-1.35	4.07 *
6th vs. 11th	-0.13	-9.53 *
1st vs. 11th	-1.21	-5.14 *
Math vs. S.S.	-0.44	4.47 *
-30 vs. +40	0.78	0.51
F vs. M	-0.41	-3.82 *
M 6th vs. 11th	-0.89	-4.50 *
F 6th vs. 11th	-0.76	-4.69 *
6th M vs. F	-2.27	2.95 *
11th M vs. F	-1.23	0.77

The teacher as target then tends to be at the center front of the room. If the target is not the teacher, then again he is likely to be located in the center band. However, sometimes, but not often, the target is located outside the band when the teacher is emitter.

Teacher Role Assignment and Teacher Location

Although teacher role assignment and teacher location do not predict equally to each other, all the subsets yield significant Lambdas. Overall, knowing the teacher role assignment makes it possible to eliminate 22% of the errors in predicting to teacher location. Prediction in the other direction produces a Lambda of .107 or 10%.

Only three of the independent variable defined subset comparisons produce statistical significance, all for predictions from teacher role assignment to teacher location. They favor: male teachers over female teachers; male eleventh grade teachers over male sixth grade teachers; and female sixth grade teachers over male sixth grade teachers.

The matrix in Figure 7-74 permits a series of "if - then" generalities to be made.

(i) If the teacher is diffusely located then he is most likely non-involved or an audience member.

(ii) If the teacher is at 24 or 25 (where he usually is) then he is most likely to be emitter and next most likely to be target. This holds good for nearly every other location as well.

Figure 7-74. -- Coincidence of Teacher Role Assignment and Teacher Location For All Classrooms

Location	11	21	22	23	24	25	26	32	33	34	35	36
Assignment												
1	64	(2)	(4)	(113)	(1532)	(243)	(16)	(52)	(28)	(179)	(27)	(120)
2	8	1	4	39	1092	89	8	29	17	89	14	37
3	266				12	4						
4	1				63	8	2	1	9	87	3	3
5	1			1	64	8	2	1	6	61		
6	16				3							
7					1							
8												
9	1											
0	(367)				6					1	1	1
TOT	724	3	8	153	2773	352	28	83	60	417	45	161

Location	42	43	44	45	46	52	53	54	55	56	63	64
Assignment												
1	(26)	(70)	(112)	(64)	(42)	(19)	(7)	(116)	(12)	(15	(3)	(12
2	11	52	60	59	21	9	1	28	11	11		3
3								3				
4	1	2	14	5	1	9	3	21	4	3		6
5		4	11	2	2	1	1	9	5	2		
6												
7												
8												
9												
0		1	1	2			1	3				
TOT	38	129	198	132	66	38	13	180	32	31	4	21

Location	65	66	(0)	TOT
Assignment				
1	(6)	(3)	20	(2907)
2	2		5	1700
3			5	290
4	(6)		4	256
5			2	183
6				19
7				1
8				
9				1
0			98	483
TOT	14	3	134	5840

Figure 7-75. -- Coincidence: Percentage Error Elimination For Teacher Role Assignment and Teacher Location

Independent Variables	Relationship		
	RA>TL	TL>RA	RA, TL
All Classrooms	22% *	11% *	17%
First Grade	23% *	8% *	15%
Sixth Grade	24% *	13% *	19%
Eleventh Grade	25% *	15% *	19%
Mathematics	23% *	15% *	19%
Social Studies	22% *	10% *	16%
Younger Teachers	21% *	11% *	16%
Older Teachers	26% *	11% *	18%
Female Teachers	28% *	9% *	18%
Male Teachers	19% *	15% *	17%
Male Sixth Gr.	14% *	13% *	13%
Female Sixth Gr.	35% *	20% *	28%
Male Eleventh Gr.	25% *	16% *	20%
Female Eleventh Gr.	28% *	15% *	19%

Figure 7-76. -- Independent Variable Coincidence Comparisons Teacher Role Assignment and Teacher Location

Independent Variables	z scores	
	TRA>TL	TL>TRA
1st vs. 6th	-0.24	-1.63
6th vs. 11th	-0.48	-0.53
1st vs. 11th	-0.62	-2.06
Math vs. S.S.	0.59	1.98
-30 vs. +40	-1.99	0.10
F vs. M	3.39 *	-1.98
M 6th vs. 11th	-3.20 *	-0.82
F 6th vs. 11th	0.90	1.09
6th M vs. F	-6.41 *	-1.79
11th M vs. F	-0.44	0.28

(iii) If the teacher has a role then he will most likely be located at 24-25 first, 34 second, 44 third, 54 fourth. The teacher seldom finds his way right to the back of the room.

The teacher, it seems, is a creature of habit frequenting the same locations regularly. He also apparently likes to keep well within the public eye, no matter the role in which he is cast.

Teacher Location in Central Group Emitter Location

Knowing teacher location permits the elimination of 37% of the error in predicting emitter location (Lambda = .373). Prediction in the reverse direction produces a Lambda of .286 or 29%.

All independent variable subsets produced significant Lambdas for both directions of prediction.

Of the thirteen significant z scores resulting from the independent variable defined comparisons, five were significant in both directions. These results favored: grade six over grade one; younger teachers over older teachers; male teachers over female teachers; male sixth grade teachers over female sixth grade teachers; and male eleventh grade teachers over female eleventh grade.

The matrix in Figure 7-77 prompts the following interpretations.

(1) In 55.8% of all instances the teacher is the emitter.

(2) If emitters are diffusely located (#11) then the probability that the teacher will be located at 24 is almost identical with the probability that he will be at 24 at any time.

(3) Because teacher location and emitter location are likely

Figure 7-77. -- Coincidence of Teacher Location and Central Group Emitter Location For All Classrooms

Emitter Location	11	15	22	23	24	25	26	32	33	34	35	36	42	43
Teacher Location														
11	75			4	144	2			17	35	1			14
12														
13														
14														
15														
16														
21					24					1				1
22			(3)	1	1				1	2				
23	9			(112)	1				9	6	1			2
24	(219)	(1)		1	(1537)	5	2	2	(95)	(305)	(47)	2	1	69
25	19			1	3	(237)		1	12	23	7			4
26							(16)			1	1			
31														
32	2				1			(52)	4	7	6			
33									35	3				
34	9				4				2	200	5			6
35						2				3	32	1		
36	3								4	10	1	(120)		6
41														
42	2									3			(26)	1
43	19									15				(70)
44	8				3	1			1	5	3	1		2
45	2				1				9	11	14			9
46	2				1				4	4				1
51														
52	4								1	1				
53					2									
54	9				8				3	5	2			1
55	1									1				
56	3													1
61														
62														
63					1									
64											1			
65														
66														
99														
0	3				19				1	5	2	1		1
TOT	389	1	3	119	1729	247	18	55	198	646	123	125	27	188

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Figure 7-77. (Continued)

Emitter Location Teacher Location	44	45	46	52	53	54	55	56	63	64	65	66	99	0	TOT
11	18	7	16		19	28	14			1	1	1	10	393	800
12															
13															
14															
15															
16															
21															4
22															8
23	8					3							4	1	156
24	(208)	62	2		(22)	103	(49)						(143)	80	2955
25	14	3			8	4	5						5	14	360
26	1	1			1	1							2	4	28
31															
32	7					3							3	2	87
33	5				1									12	57
34	15	2	1		6	6	4						10	48	319
35	2						1						1	4	46
36	7	2	1		1	4	2						2	3	166
41															
42					1	4							2	1	40
43	2				1	10	1				1		10	7	135
44	129	4	1		5	7	1						4	18	193
45	17	(70)											3	8	144
46	2		(43)			3							3	2	65
51															
52	1			(19)	3	4								9	42
53					7									4	13
54	1	2	1		6	119	4						2	23	186
55		1				1	19						1	9	33
56	1	1					5	(15)						5	31
61															
62															
63									(3)						4
64						2				(12)				6	21
65											(8)	1		6	15
66												(3)			3
99															
0	9		2			5					2		6	81	137
TOT	447	155	67	19	81	307	105	15	3	13	12	5	211	740	6048

Figure 7-78. -- Coincidence: Percentage Error Elimination For Teacher Location and Central Group Emitter Location

Independent Variables	Relationship		
	TL>EL	EL>TL	TL, EL
All Classrooms	37% *	29% *	34%
First Grade	35% *	25% *	31%
Sixth Grade	41% *	37% *	39%
Eleventh Grade	36% *	43% *	39%
Mathematics	45% *	34% *	40%
Social Studies	32% *	28% *	31%
Younger Teachers	42% *	35% *	39%
Older Teachers	33% *	24% *	30%
Female Teachers	32% *	20% *	27%
Male Teachers	44% *	44% *	44%
Male Sixth Gr.	48% *	51% *	49%
Female Sixth Gr.	35% *	34% *	35%
Male Eleventh Gr.	41% *	49% *	44%
Female Eleventh Gr.	22% *	17% *	21%

Figure 7-79. -- Independent Variable Coincidence Comparisons Teacher Location and Central Group Emitter Location

Independent Variables	z scores	
	TL>EL	EL>TL
1st vs. 6th	-2.65 *	-3.47 *
6th vs. 11th	2.16	1.87
1st vs. 11th	-0.57	-4.57 *
Math vs. S.S.	6.07 *	1.89
-30 vs. +40	4.76 *	3.58 *
F vs. M	-6.01 *	-8.47 *
M 6th vs. 11th	2.44	0.42
F 6th vs. 11th	3.15 *	1.73
6th M vs. F	4.13 *	4.65 *
11th M vs. F	4.78 *	3.42 *

to coincide more often than not, principle interest lies in discovering whether there are persistent patterns in the instances of non-coincidence. The following secondary patterns are worthy of recognition:

(i) If the emitter is at 24 then the teacher is likely to be diffusely located.

(ii) If the emitter is at any location other than the teacher's location, the teacher is likely to be at 24.

(iii) If the teacher is at any location other than the emitter's location, the emitter is likely to be in the center band and more likely to be towards the front of it.

It seems as if the center band area defines an emitting zone and that characteristically the teacher is located either towards the front or up and down the band. However, when an emitter other than the teacher is at 24 then the teacher apparently feels free to perambulate outside the zone.

Teacher Location and Central Group Target Location

Teacher location and target location predict about equally well to one another. Knowing about teacher locations permits the elimination of 28% of the error in predicting target location (Lambda = .283). Knowing about target location permits the elimination of 23% of the error in predicting teacher location (Lambda = .225).

All the independent variable defined subsets yield significant Lambdas.

Four of the comparison z scores produce significant Lambdas in both directions. These indicate that greater predictability occurs for: sixth grade against first grade; male teachers against female teachers; male sixth grade teachers against male eleventh grade teachers; and male sixth grade teachers against female sixth grade teachers.

Predictability is greater from teacher location to target location for sixth grade over eleventh grade; for first grade over eleventh grade; and for male sixth grade over female sixth grade.

The only other instance where predictability from target location to teacher location is greater, favors younger teachers over older teachers.

In Figure 7-80 the largest figures tend to be located on the major diagonal of the array. This indicates that teacher location and target location tend to be the same, (that either the teacher is the target, or that the target and the teacher are spatially very close to one another.) However, this association only accounts for 54.11% of all the relevant instances. Consequently, some insight into the structure of the classroom can result from an examination of the remaining instances. Here the results are similar to those presented in the preceding section. When the teacher is not the target and when he is away from location 24 he is likely to be in the center band and the target is likely to be either at the front (24) or somewhere else in the center band. Again, it is almost inevitable that if the target is diffuse the teacher will be at the front of the room. Unlike the emitter data, however, if the teacher

Figure 7-80. -- Coincidence of Teacher Location and Central Group Target Location For All Classrooms

Target Teacher	11	12	13	14	15	21	22	23	24	25	26	31	32	33
11	6								22				1	16
12														
13														
14														
15														
16														
21						(1)								
22							(4)		1					
23	3			(1)				(43)	4			1	1	5
24	(26)	(1)	(3)	(1)	(1)	1		5	(1160)	7	1	1	2	(48)
25	5								2	(92)				4
26	1										(8)			
31														
32													(29)	4
33		(1)						1	3					21
34	5				(1)			1	12	1				4
35								1	2	1				
36	1								1	1				4
41														
42									2				1	
43				(1)					4					1
44	3			(1)		1		1	15					
45									12					
46														1
51														
52									4					
53														
54									62		1			4
55	2								7					
56									1					1
61														
62														
63									1					
64									1					
65														1
66														
99														
(0)									12					2
TOT	55	2	3	4	2	3	4	52	1336	102	10	2	34	116

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Figure 7-80. (Continued)

Target	34	35	36	41	42	43	44	45	46	52	53	54	55	56
Teacher														
11	18	1			1	7	10	3	2		9	13	16	
12														
13														
14														
15														
16														
21														
22														
23	7	1	1		2	1	2							
24	(162)	(41)	2	(1)	5	35	(150)	24	8		(6)	(100)	(25)	1
25	14	10	2			6	6	4	6		1	6	3	1
26	1							1					1	
31														
32	2	5										5		
33	3		1			1	1							
34	108	10	1			3	18	3	1		2	2	3	
35	2	17					1	1						
36	17	1	(39)			3	9	3	6			3	3	1
41														
42	1	2			(12)	1	2				1	1		
43	2					(56)	3				1	3		
44		3	4			5	65	1			2	5	1	
45	8		1			4	7	(56)				2		
46	4	1					3	1	(25)				2	
51														
52		1				1				(9)	1	1		
53												2		
54	12	4				2	5				(6)	32	6	
55	2	1	1			1	1						4	
56	3										2	1	5	(11)
61														
62														
63														
64							1							
65							1		1			1		
66							1							
99														
(0)	5		2				4	1	1			5		
TOT	371	98	54	1	20	126	291	98	50	9	33	185	69	14

(continued next page)

Figure 7-50. (Continued)

Target	62	63	64	65	99	0	TOT
Teacher							
11		(1)		1	3	633	770
12							
13							
14							
15							
16							
21						2	3
22						3	8
23			1			96	169
24	(1)		1	1	(69)	1665	3554
25			2	1	3	213	301
26						15	27
31							
32						50	96
33					1	27	60
34				1	3	170	349
35						21	46
36					5	109	211
41							
42						17	40
43					3	64	133
44				1	5	103	221
45					1	61	152
46					1	34	72
51							
52						22	39
53						10	13
54					2	67	206
55					1	13	33
56						13	42
61							
62							
63						3	4
64			(4)	1		14	21
65			1	(2)		3	13
66				1		1	3
99							
0					5	104	141
TOT	1	1	9	9	102	3548	6814

Figure 7-81. -- Coincidence: Percentage Error Elimination For Teacher Location and Central Group Target Location

Independent Variables	Relationship		
	TL>CGTL	CGTL>TL	TL,CGTL
All Classrooms	20% *	23% *	20%
First Grade	28% *	21% *	26%
Sixth Grade	40% *	35% *	38%
Eleventh Grade	18% *	24% *	20%
Mathematics	20% *	21% *	25%
Social Studies	30% *	29% *	30%
Younger Teachers	32% *	29% *	31%
Older Teachers	25% *	18% *	22%
Female Teachers	25% *	16% *	21%
Male Teachers	34% *	37% *	36%
Male Sixth Gr.	58% *	52% *	50%
Female Sixth Gr.	25% *	20% *	23%
Male Eleventh Gr.	18% *	26% *	21%
Female Eleventh Gr.	26% *	13% *	22%

Figure 7-82. -- Independent Variable Coincidence Comparisons: Teacher Location and Central Group Target Location

Independent Variables	z scores	
	TL>CGTL	CGTL>TL
1st vs. 6th	-3.21 *	-2.24 *
6th vs. 11th	6.21 *	2.15
1st vs. 11th	2.62 *	-0.53
Math vs. S.S.	-0.93	-2.17
-30 vs. +40	2.52	2.62 *
F vs. M	-3.13 *	-3.47 *
M 6th vs. 11th	7.42 *	3.83 *
F 6th vs. 11th	-0.04	0.32
6th M vs. F	8.56 *	8.60 *
11th M vs. F	-0.85	0.95

is diffusely located, the target will most likely be somewhere other than center front.

It seems from this interpretation that the relationship between teacher and target is very much propinquitous. Neither tends to be very far away from the other.

Several other structural inter-relationships were sought among the dependent variables of the study. However, because they yielded no significant results, the data have not been presented. The analyses were: (1) teacher location and audience location; (2) teacher role assignment and role allocation; (3) communication structure and role structure; (4) role allocation and non-involved actor locations; (5) teacher role assignment and audience location.

Summary

What, then, has been learned about the coincidence of structural relationships in the classroom? In what ways are structural-structural coincident properties different from or similar to functional-structural coincidences?

First of all, it is clear that structural properties were more likely to predict to other structural properties than they were likely to predict to (or be predicted from) functional properties. While many Lambdas in the first half of the chapter were found to be statistically insignificant, most of the relationships in the second half of the chapter not only achieved significance but often represented 30 or more percent of the predictive variability accounted for. Thus, we now have some empirical validation for the original lumping of such disparate phenomena as role structure,

Figure 7-83. -- Non-Directed Lambas For Independent Variable Defined Subsets

	CS					RS		RA				TRA			TL		
	RA1	TRA	TL	RA Per.	RS Per.	TRA	TL	EL	TarL	AL	TL	EL	Tarl	TL	EL	TarL	Mean
All Classrooms	6	13	10	16	7	36	4	25	20	1	10	25	24	17	33	26	17.1
First Grade	4	11	10	11	1	35	2	26	21	1	11	24	27	15	31	26	16.0
Sixth Grade	14	18	13	9	13	26	3	20	15	2	11	22	19	19	39	38	17.6
Eleventh Grade	1	12	12	15		45	42	35	35	1	10	38	38	19	38	20	22.6
Mathematics	11	20	14	11	11	30	5	23	23	2	9	25	29	19	40	25	18.6
Social Studies	3	7	10	10	1	41	3	28	20	1	12	27	22	16	31	30	16.4
Younger Teachers	2	18	9	22	16	33	5	26	23	1	9	23	26	16	39	11	17.4
Older Teachers	9	11	13	11	3	26	4	28	21		13	28	27	18	30	22	16.5
Female Teachers	3	17	9	20	19	33	4	26	21	3	12	23	26	18	27	21	17.3
Male Teachers	11	11	15	11	1	39	6	26	22	2	9	31	28	17	44	35	19.2
Male Sixth Grade	20	12	20	1		47	6	27	19	4	10	30	18	13	49	58	20.9
Female Sixth Gr.	2	29	12	23	24	5		21	20	1	22	17	20	29	35	23	17.7
Male Eleventh Gr.	1	12	10	15		37	6	33	36	1	13	36	38	20	44	21	20.2
Female Eleventh Gr.	3	14	25	12	7	71	6	45	33	2	4	46	41	19	21	22	23.2

CS - Communication Structure
RS - Role Structure
RA - Role Allocation
TRA - Teacher Role Assignment
TL - Teacher Location
RA Per. - Role Allocation, Peripheral
RS Per. - Role Structure, Peripheral
EL - Emitter Location
AL - Audience Location
TarL - Target Location

location, and role allocation into a single category of "classroom structure".

However, some structural-structural relationships were stronger than others. In order to examine this problem, it is convenient to tabulate Lambdas for various types of comparison into a single table. This is done in Figure 7-33 where values for the non-directed Lambdas (that is, those that were averaged) are displayed for each type of comparison and each type of classroom subset. It is useful to summarize in propositional form some of the major features of this table.

Proposition 7-16. The "strongest" structural property of classroom activity is *emitter location*, predicting to an average of 28 percent of three, other structural characteristics (role allocation, teacher role assignment, and teacher location).

Proposition 7-17. The second "strongest" structural property of classroom activity is *teacher role assignment*, predicting to an average of 23 percent of five, other structural characteristics (communication structure, role structure, emitter location, target location, teacher location).

Interestingly, both of these variables were also relatively strong predictors to classroom functions, and appeared as column headings in Figure 7-33. Thus, we are reminded once again that the classroom tends to be dominated by teacher role and, perhaps less obviously, by the location of the speaker. Other structural variables were considerably "weaker"; communication structure predicted to only an average of 10 percent of other structural variables, role

Figure 7-84. -- Direction* of Significant Differences In Variable Subset Comparisons

	CS					RS		RA				TRA			TL	
	RA	TRA	TL	RA Per.	RS Per.	TRA	TL	EL	TarL	AL	TL	EL	TarL	TL	EL	TarL
1st/6th	- (-)		-			+		+					(+)		+ (-)	- (-)
6th/11th	+ (+)				+	-		(-)	(-)			- (-)	(-)			+
1st/11th						(-)		(-)	(-)			(-)	(-)		(-)	+
Math/S. S.	+ (+)	+ (+)	(+)			(-)		(-)			-		(+)		+	
-30/+60	(-)	(+)		(+)	+ (+)	+									+ (+)	(+)
F/M	(-)	(+)	-	(+)	+ (+)	-		+ (-)			+	(-)	(-)	+	- (-)	- (-)
M6th/M11	+ (+)		(+)	(-)		- (+)		(-)	(-)				(-)	-		+ (+)
F6th/F11		+ (+)	(-)			- (-)		- (-)			(+)	- (-)	(-)		+	
6thM/6F	+ (+)	- (-)	+	(-)	- (-)	+ (+)		(+)		-	-	(+)	(+)	-	+ (+)	+ (+)
11thM/11F			- (-)			- (-)		- (-)	(+)						+ (+)	

* + indicates that the higher Lambda was achieved by the first listed independent variable.

- indicates the reverse.

The upper sign in each cell indicates a significant prediction in the direction indicated by the column heading. The lower sign (in parentheses) indicates prediction in the reverse direction.

CS - Communication Structure
RS - Role Structure
RA - Role Allocation
TRA - Teacher Role Assignment
TL - Teacher Location
RA Per. - Role Allocation, Peripheral

R.S. Per. - Role Structure, Peripheral
EL - Emitter Location
TarL - Target Location
AL - Audience Location

allocation to 12 percent, teacher location to 17 percent, audience location to a mere 1 percent, for example.

It is also useful to observe within Figure 7-83 that classroom subsets are not equally likely to generate strong relationships among structural properties. Most of these relationships appear to be idiosyncratic to the choice of structural variables being compared, but one generalization stands out for structural variables taken as a whole.

Proposition 7-18. Eleventh grade classes exhibit more general predictability among structural properties than do either first or sixth grade classes.

It will be recalled that earlier in the chapter we have suggested that eleventh grade classrooms exhibit a formal, reciprocal relationship between function and non-involved actor location suggesting that only when the central group collapses do non-involved persons appear. We now learn that the eleventh grade is simply more structurally organized than either the first or sixth grades.

Teasing out the details of relationship between classroom subsets and structural variables is difficult from Figure 7-83, however. Figure 7-84 has been prepared by tabulating the instances when signed Lambdas for classroom subsets were significantly different from one another and is similar in form to Figure 7-33. Since, in addition, many of the structural variables appear over-and-again throughout Figure 7-84, a summary table for it has been prepared in Figure 7-85. Figure 7-85 examines the numbers of significant differences for comparisons involving five of the structural variables

Figure 7-85. — Numbers of Signed, Significant Differences in Independent Variable Subset Comparisons

	Communicative Structure N=5*		Role Allocation N=5		Teacher Role Assignment N=5		Teacher Location N=6		Emitter Location N=3		All Comparisons N=16	
	+	-	+	-	+	-	+	-	+	-	+	-
1st vs. 6th	0	3	1	2	2	0	1	4	2	1	4	6
6th vs. 11th	3	0	2	2	0	4	1	0	0	3	4	6
1st vs. 11th	0	0	0	2	0	3	1	1	0	3	1	6
Math vs. S. S.	5	0	2	2	3	1	2	1	1	0	7	2
-30 vs. +40	4	1	0	1	2	0	3	0	2	0	8	1
F vs. M	4	2	2	2	2	3	2	5	1	4	7	1
M 6th vs. M 11th	3	1	2	2	1	3	2	1	0	1	5	6
F 6th vs. F 11th	2	1	1	2	2	5	2	1	1	4	4	8
6th M vs. 6th F	3	5	3	2	5	2	5	2	4	0	13	7
11th M vs. F	0	2	1	2	0	2	2	2	2	2	3	6

Note: Columns labeled "+" indicate occurrences when better prediction was achieved for first listed independent variable; "-" indicates better prediction for second independent variable.

*N=Number of comparisons made. In fact, entries within any cell of the table may equal 2N because two types of comparisons may appear within a cell in Figure 7-84.

communication structure, role allocation, teacher role assignment, teacher location, and emitter location). In addition, a column is presented in which all sixteen comparisons reported in Figure 7-84 are summarized.

A variety of findings may be summarized from Figures 7-84 and 7-85. We first take up those associated with grade level.

Proposition 7-19. Sixth grade classes exhibit more predictability from communication structure to other structural properties than do either first or eleventh grade classes.

Proposition 7-20. Sixth grade classes exhibit more predictability from teacher location to other structural properties than do either eleventh and (particularly) first grade classes. (There is one exception to this proposition; a reversal appears for the relationship between teacher location and emitter location -- contradicted by its paired reversal -- presumably a random result.)

Proposition 7-21. Eleventh grade classes exhibit more predictability from teacher role assignment to other structural properties than do either first or sixth grade classes (and first more than sixth).

Proposition 7-22. Eleventh grade classes exhibit more predictability from emitter location to other structural properties than do either first or sixth grade classes.

Once again, we discover that eleventh grade classes are most typically traditional in form. Propositions 7-16 and 7-17 stressed the dominance of emitter location and teacher role assignment as structural determinants of classroom activity; we now learn that these two variables predict more strongly to structural events at the eleventh grade level. By way of contrast, sixth grade classes are structurally dominated by communication structure and teacher location, again suggesting their flexibility of form and response to the teacher.

Although there is a general tendency for mathematics classes to be more structured than social studies classes, this result depends primary upon the domination of communication structure over the other structural variables.

Proposition 7-23. Mathematics classes exhibit more predictability from communication structure to other structural properties than do social studies classes.

[illegible] ness of the *other* structural variables in predicting the dominance of mathematics classes. There is little hint of teacher-control here, of role allocation, or of emitter location. Rather, the formal characteristics of communication groups per se tend to characterize the structural predictability of mathematics classes.

In contrast, younger teachers' classes are also more structurally predictable than older teachers' classes, but the source of this predictability is spread diffusely throughout various structural variables.

Proposition 7-24. Younger teachers' classes exhibit more predictability among structural variables generally than do older teachers' classes.

There is one exception to this generalization; role allocation appears to make but little difference in predictability between younger and older teachers' classes. The significance of this latter should not be over-rated, however; role allocation generally did not differentiate _any_ subsets of classes in this analysis! Proposition 7-24, thus, is generally similar to 7-14, and we can conclude a generally greater tendency for structuredness among the classes of younger teachers.

No overall finding for teacher sex appears in Figure 7-85. However, this lack of an overall finding smothers an interesting sex-grade level reversal.

Proposition 7-25. At the sixth grade level classes of men teachers exhibit more predictability among structural variables than do classes of women teachers; at the eleventh grade level the opposite obtains, women teachers' classes exhibit more predictability. No immediate interpretation appears for this finding, and it might just be accidental. However, if we had to interpret it we would stress a greater need for the classroom control that structure involves on the part of women teachers who should be relatively weaker at the eleventh grade level in comparison with their pupils. Why men sixth grade teachers should exhibit more structural predictability is a mystery.

It should be noted once again that Figures 7-35 through 7-82 contain a wide variety of individual findings that are statistically significant. In particular, it is beyong our power to reinterpret here all of the details with which categories of structural variables are associated with other categories, either for classrooms

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taken together or for classroom subgroups. The reader is urged to study Figures 7-35 through 7-82 and their textual interpretation in detail should his interests lie in the details of structural coincidence.

Comment

The relative weakness of functional-structural relationships in the first part of the chapter deserves some speculative comment. It is possible that the relative lack of discrimination shown may be an artifact of the methodology used in the analysis. In the computation of Lambda as a statistic, the cell within a column or row that has the highest frequency is set against the frequency total, thus single categories come to play an overly important part. Furthermore, Lambda is not designed to permit prediction from single categories within one variable to another. Looking at the functional-structural matrices, they appear on face value to have more predictive power than the values of Lambda reveal. It may be that when more accomodating statistical techniques become available, more findings may emerge from these data.

It is also possible that the functional categories themselves were not sufficiently refined. It will be recalled that the gross nature of these categories has been acknowledged earlier, and refinement of them is projected.

A final matter is the possibility that some findings were, unwittingly, artifacts of the coding system used. Apparent artifacts were eliminated prior to analysis, but the possibility remains that some were undetected. For instance, it was "found" that when function is undetermined, it is likely that the teacher is the target. In some cases this may mean that the message from the pupil emitter is simply not recorded adequately. By the same token, the apparent "strength" of some structural-structural comparisons may also be artifactive.

However, the fact remains that findings from the second half of the chapter were simply far stronger than those from the first half. This suggests also the realistic interpretation that classroom function may, indeed, be more or less independent of its structure under many conditions. Indeed, various superficial philosophies of education have occasionally upheld this independence of function and structure as a virtue. Thus, whatever the classroom may be "doing" it must always be quiet, decorous, and "organized," etc. We return to this problem of structural-functional interdependence in the final chapter.

CHAPTER VIII

SEQUENTIAL CHARACTERISTICS OF CLASSROOM ACTIVITIES

This chapter concerns itself with the problem of sequence in classroom activity phenomena. Given the various ways in which classroom activities have been coded, which types of classroom events tend to follow what others?

It should be appreciated that in its fullest sense this is a problem of enormous complexity, and that only a simple answer is attempted here. Let us assume that we have a sequence of classroom activities: a, b, c, d, ..., etc. Given any of these events, for example "b", there exists a distinct probability that an activity classification into which "b", falls will decay into an activity classification into which the subsequent event, "c", falls. Analyses of such relationships between two activity events that are adjacent in the sequence, b-c or c-d for instance, we shall refer to as analyses of sequences of length one. Note that all data reported in this chapter are analyses of sequences of length one.

However, more complex sequential information may also obtain for activity sequences. It is, of course, possible that the probability of an activity classification into which "b" falls of decaying into an activity classification into which "c" falls is independent of the classification of "a". (In which case, activity sequences would form simple Markov chains, and the findings presented in this chapter would be sufficient to generate all findings for sequences of length greater than one.) But it is more likely that the probability of "b-c" depends on the classificatory state of "a", and that of "c-d" upon the classificatory states of both "a" and "b", and so on. If these latter are true, then analyses of sequences of lengths two, three and so on will generate information that is supplementary to the information presented here. However, it may be readily appreciated that techniques for sequential analysis of lengths greater than two are difficult, require enormous amounts of computer time, and are only now being developed. Consequently, the analyses presented here were confined to the length one condition.

Another limitation of coverage in this chapter concerns the choice of facets for classifying activities. Given our coding system, a variety of activity characteristics have been coded independently. For example, each activity was rated for communication structure, role allocation in the central group, function of the central group, and so on. It is possible, of course, to analyze sequences among activities where both of the adjacent activities are examined for a single, selected facet. (For example, it is possible to examine activity sequences in terms of their sequential states of central group function.) Analyses of this type we shall term intrafaceted, and we note that all data reported in the chapter were generated by intrafaceted analyses.

It is also possible, however, to analyze sequences making use of two (or more) facets. For example, it is reasonable to ask whether states of central group function generate predictable conditions of role allocation in the central group in the next activity of the sequence. Interfaceted analyses of these latter sort generate considerably more tables than do intrafaceted analyses (where N is the number of facets, (N - 1)! to be exact). Although interfaceted tables were prepared for the 32 classrooms of our study, inspection suggested that their results either tended to duplicate those of Chapter VII or were simply random, and consequently they are not reported here. Presumably a larger sample of classrooms would generate unique, interfaceted relationships.

To summarize, coverage of the problem of sequential relationships among classroom activities is restricted here to the intrafaceted analysis of sequences of length one.

Three different kinds of findings are presented. The first of these is based on the episode (the shortest possible incident during which no structural or functional changes occur) and reports the extent to which any type of episode tends to be followed by another in which the prevailing variable class is the same. The second is concerned with the sequence of incidents within a given variable class. An incident, as distinct from an episode, must always be homogeneous throughout its duration only *from the standpoint of the variable class which is being used to define it*. For instance, in the functional variable class, an incident of information dissemination about relevant subject matter would only be terminated by a change to another function. By contrast, an episode is terminated by *any* change of *any* structural or functional variable condition. The third is concerned with estimating whether or not there is a tendency for one variable state (type of incident) to reciprocate with another; in other words, whether there is a tendency for variable state x to follow variable state y to the extent that y follows x.

The findings are presented in three sets of tables and in the text. The first set of tables comprises matrices in which one dimension (the ordinate) is defined as the antecedent and the other (the abscissa) as the subsequent. Each cell contains a count of the number of times that activities classified within the antecedent category preceded activities classified within the subsequent category. The center diagonal in the matrix contains the episode frequencies of the instances when there was a change in any variable class, irrespective of what variable class defines the table. The other cells contain incident frequencies or the instances when there was a change _only_ in a variable of the variable class defining the table. By deleting the center diagonal of the matrix, the analysis is converted from an episode to an incident basis.

The following variable classes were considered in the analysis:

(1) Function (Central and Peripheral)
(2) Communication Structure
(3) Role Allocation (Central and Peripheral)
(4) Role Structure (Central and Peripheral)
(5) Non-involved Actor Identification
(6) Teacher Role Assignment
(7) Teacher Location
(8) Emitter Location (Central and Peripheral)
(9) Target Location (Central and Peripheral)
(10) Audience Location[1] (Central and Peripheral)
(11) Non-involved Actor Location[1]

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[1] Described in the text only.

The second set of tables presents statistical information derived from the primary data when the sample was subdivided on the basis of certain independent variables. Fourteen groupings were used. They are:

All classrooms together
First Grade
Sixth Grade
Eleventh Grade
Mathematics Lessons
Social Studies Lessons
Older Teachers
Younger Teachers
Female Teachers
Male Teachers
Male Sixth Grade Teachers
Female Sixth Grade Teachers
Male Eleventh Grade Teachers
Female Eleventh Grade Teachers

Three kinds of statistics were employed. The first is Cohen's K, (Cohen, 1960), a coefficient of agreement for nominal scales. K is designed as a ratio of the excess or deficit of entries appearing in the major diagonal of a matrix, over those that would appear by chance alone, divided by entries that would appear by chance elsewhere in the matrix. K scores may range (theoretically) between -1 and +1 and may be interpreted roughly as a signed percentage probability. Thus a K score of +.50 means that of all the scores in the matrix the number exceeded chance by 50%. Because the scores in the diagonal denote episodes in which the antecedents and consequence specified remain constant, this phenomenon is here termed persistence.

The second statistic, Lambda, has been discussed elsewhere (see Appendix D). Briefly, Lambda indicates the percentage of error that may be eliminated in predicting from one situation (class of data) to another. In the current analysis, Lambda has been used to indicate the probability that knowing the antecedent case may permit the prediction of the subsequent case. In computing Lambdas, the major diagonal of the matrices has been deleted -- thus removing repeated episodes that would otherwise have inflated the values of Lambda. This phenomenon is here termed predictability.

The final statistic tests whether among all pairs of variables, each tends to be the antecedent as frequently as it tends to be the subsequent. This phenomenon is here termed reciprocality, and was assessed by Bowker's Chi square test for symmetry of a matrix (Bowker, 1948). This statistic tests the null hypothesis that the two halves of a square matrix (separated by the major diagonal) are insignificantly different from one another. If the Chi square (the squared difference of mirror image cells divided by the sum of these cells) is large enough, then the matrix is judged to be asymmetrical. Most of the sequential matrices reported in this chapter command degrees of freedom in excess of those provided for in a standard Chi square table. It is possible, in these cases, to make a z transformation of the Chi square values, in which case asymmetricality of the matrix (at $p < .01$) is judged if the z score exceeds the value of +2.58. It will be noted, however, that most values of z to be reported are negative in sign, indicating that the matrices from which they were judged departed but little from absolute symmetry. Since the Chi square distribution is but one-tailed with respect to the null hypothesis of symmetricality, it is impossible to judge whether these matrices are "significantly symmetrical." However, those matrices of equal size that are characterized by large, negative z scores are "more symmetrical" than those characterized by smaller, negative z scores or by positive z scores. It should also be noted that values of Bowker's Chi square and its z transformation are affected by both the absolute number of episodes considered and the size of the matrix involved. In general, a large symmetrical matrix will generate larger negative z scores than a small matrix, while increasing the number of classes whose data are summed in the matrix increases the probability of a positive (significant) z score.

Finally, a third set of tables is also displayed which employ the independent variables (subject matter, grade level, sex and age of teacher) to define subsets of the sample which are then compared. The comparisons yield information on which of the two subsets is more predictable than the other. Two kinds of comparisons are made -- comparisons of Lambdas (which indicate whether knowing the antecedent permits better prediction of the subsequent in the case of one subset rather than the other), and comparisons of z scores (which indicate whether there is a stronger tendency for like episodes to follow each other in the case of one or the other of the subsets).

As a general strategy the results have been presented as (1) tables, (2) textual description of the salient features of the tables, and (3) textual interpretation of the tables. In the last mentioned, attention is given to the independent variables within variable classes. Unfortunately, the statistics available only permit conclusions about the "global" character of specific variables, and analysis of their inter-relationships has to be made by inspection. The interpretations that result then do not have the authority that comes with statistical sophistication.

Figure 8-1. -- Sequential Analysis: Function (Control Group) for All Classrooms

		Subsequent														
	Fn.	11	12	13	14	21	22	23	24	31	32	33	34	99	0	TOT
Antecedent	11	201*		(1)		17	2	1	17					1	6	326
	12		*			1			1							2
	13			(3*)			1	1	2						3	10
	14				*											
	21	17		(1)		4419*	(84)	(13)	(315)	(334)	(3)		9	5	75	5277
	22	2	1	(1)		86	675*	7	74	11	2		4	5	44	912
	23					18	10	24*	11	3		1			3	70
	24	(20)	1	(1)		(320)	67	8	1191*	48	2	(3)	(18)	(9)	174	1862
	31	1				216	19	8	79	1163*	2	1	2		11	1502
	32					6	1			1	10*				2	20
	33					2			1	2		6*				11
	34					8	3		16	7			54*		3	91
	99					10	1		11		1			28*	5	56
	0	4		(1)		90	44	6	133	13			4	8	1432*	1737
	TOT	325	2	10		5273	907	70	1851	1502	20	11	91	56	1756	11956

Legend: Function

11 = operation - relevant subject matter
12 = operation - non-relevant subject matter
13 = operation - sociation subject matter
14 = operation - management subject matter
21 = info disem - subject matter
22 = info disem - subject matter
23 = info disem - sociation subject matter
24 = info disem - management subject matter
31 = intell - subject matter
32 = intell - subject matter
33 = intell - sociation subject matter
34 = intell - management subject matter
99 = Indeterminate subject matter
0 = No function

Findings

Function (Control Group)

Figure 8-1 contains a matrix that arrays the frequencies of sequential occurrence of the twelve functional variables for all classrooms lumped. In the table the episodes which fall along the major diagonal have been denoted with an asterisk. As well, the highest frequency in each row (exclusive of the frequency in the major diagonal) is underlined, and the highest frequency in the columns (again exclusive of the frequency in the major diagonal) is indicated with parentheses.*

Persistence. K scores in Figure 8-2 suggest strongly that a given functional episode will tend to be followed by another episode in which the function is the same. The overall K score is .696, and K scores for all subsets of classrooms were in an equivalent range and statistically significant.

However, the persistence of functional episodes varies strikingly depending on the functional category one looks at. For instance, out of 5277 functional episodes receiving an antecedent code of 21 (information dissemination about relevant subject matter), 4419 represented persistence of 858 represented incidents in which change took place -- a ratio of some 5 repeated episodes for every 1 incident. By contrast, the ratio for code category 23 (information dissemination about sociation) is 2:1. This implies that more structural changes are taking place during incidents of information

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*These conventions are followed in all the tables that report matrices.

Figure 8-2. -- Persistence, Predictability and Reciprocity For Function (Central)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
All classrooms	.696	.214	52.399	-3.22
1st Grade	.710	.236	29.256	-5.80
6th Grade	.686	.244	24.224	-6.49
11th Grade	.679	.334	13.305	-8.29
Mathematics	.677	.215	47.022	-3.76
Social Studies	.700	.238	20.419	-7.06
Younger Teachers	.711	.247	33.880	-5.22
Older Teachers	.667	.237	28.789	-5.87
Female Teachers	.710	.264	37.564	-4.79
Male Teachers	.672	.255	23.879	-6.54
Male 6th Gr. Teachers	.641	.163	14.148	-8.13
Female 6th Gr. Teachers	.693	.320	15.300	-7.92
Male 11th Gr. Teachers	.680	.334	13.585	-8.24
Female 11th Gr. Teachers	.668	.441	9.800	-9.03
				degrees of freedom=91.

dissemination about relevant subject matter than during information-dissemination-about-sociation incidents. The approximate ratios for all functional categories (incidents: repeated episodes) are listed below.

11 -- 1:7
12 -- 2:0
13 -- 2:1
14 -- ---
21 -- 1:5
22 -- 1:2
23 -- 2:1
24 -- 1:2
31 -- 1:3
30 -- 1:1
33 -- 1:1
34 -- 4:5

These data show that (i) functions involving relevant subject matter (codes numbers 11, 21, and 31) are associated with the greatest amount of structural change, and (ii) that sociation functions generally inhibit structural change.

Predictability. The Lambda scores in Figure 8-2 indicate that knowledge of the antecedent activity permits the elimination of 21% of the error in predicting the consequent activity for functional codes (after elimination of the major diagonal). All classroom subsets evidence similar tendencies for high predictability, although the strongest subsets are generated by eleventh grade, eleventh grade male, eleventh grade female, and sixth grade female teachers. Turning back to Figure 8-1, we find that while most antecedent codes predict to the more heavily loaded subsequent category (code 21) a few do not. Of these, the only antecedent category of high frequency is code 21 itself (which predicts to category 31). But note: once the major diagonal of the matrix has been eliminated, antecedent code

Figure 8-3. -- Independent Variable Subset Comparisons For Function (Central)

Independent Variables	Predictability (Lambda)	Persistence (K)
1st vs. 6th	-0.36	1.80
6th vs. 11th	-2.72*	0.58
1st vs. 11th	-2.85*	2.41
Math vs. S.S.	-0.81	-2.19
-30 vs. +40	0.32	4.09*
F vs. M	0.32	3.5[illegible]*
M 6th vs. 11th	-3.95*	-2.17
F 6th vs. 11th	-2.11	1.10
6th M vs. F	-3.25*	-2.68*
11th M vs. F	-2.00	0.54

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

category 21 cannot predict to itself. Thus in a sense the Lambda score is artifactual and reflects the major diagonal loading of a single code category having the high overall loading. For example, in Figure 8-1, had a smaller proportion of antecedent 21 episodes been followed by subsequent 21 episodes, the size of Lambda would have been increased. (Once again, the shortcomings of Lambda as a statistic must curtail out interpretations.)

Reciprocity. All the z transformations in Figure 8-2 are negative which implies that the two halves of the table are relatively symmetrical. A cell by cell comparison of Figure 8-1 also gives an indication of the extent of functional symmetry obtaining. The sum of the differences between all the cells in the top half of the table and their corresponding cells in the bottom half is 200. There were 2,884 instances listed altogether. The amount of difference then represents a very small gross difference and consequently a high degree of reciprocity.

Subset Comparisons. Figure 8-3 shows that when comparisons were made between the subsets of the sample defined by independent variables (grade level, age of teacher, etc.) greater predictability in z transformations is revealed in the cases of: eleventh grade over sixth grade; eleventh grade over first grade; male eleventh grade teachers over male sixth grade teachers; and female sixth grade teachers over male sixth grade teachers.

Comparisons of K scores (probabilities that an episode is a subsequent as frequently as it is an antecedent) showed that greater predictability existed for: younger teachers over older teachers;

female teachers over male teachers; and female sixth grade teachers over male sixth grade teachers.

Comment. If we confine attention to analysis of incidents only, Figure 8-1 shows that there is a tendency for any function to follow any other function to approximately the same extent as is the latter by the former. Because of the relatively few instances involved, functions #12, #13, and #14 need not be considered further. All the remaining functions except two tend to be followed more often by information dissemination about relevant subject matter, (#21) or organization (#24). The two exceptions are #21 and #24 themselves. Each tends to load primarily on the other, but #21 also has nearly as many instances when the subsequent is intellectualization about relevant subject matter (#31) and about a third as many cases when it is #22 (information dissemination about non-relevant subject matter). Function #24 (information dissemination about organization) attracts quite large scores to the same two functions (#31 and #22) but substantially fewer to #31 than does #21.

Let us now assume, for exposition purposes, that sequences of length greater than one may be constructed of simple chains built from sequences of length one. It is then possible to construct one or more N-step chains in the form of a graphical figure that represents the major sequential tendencies for a given matrix of data. For the matrix given in Figure 8-1, the following chains are characteristic:

0 ⟶ 21 21 ⇐ 24

0 ⇔ 24 21 ⇔ 31 31 ⟶ 24

21 ⟷ 22 22 ⟷ 24

(In the above notation, a single-headed arrow indicates greater probability that a sequence will occur in the direction indicated by the arrow. A two-headed arrow indicates approximately equal probability of a sequence occurring in either direction. A single-line arrow indicates frequency. A double-line arrow indicates considerable frequency.)

Let us now combine these one-step chains to form a single graph. The resulting graph appears in Figure 8-4.

Figure 8-4. -- Functional Sequence Tendencies

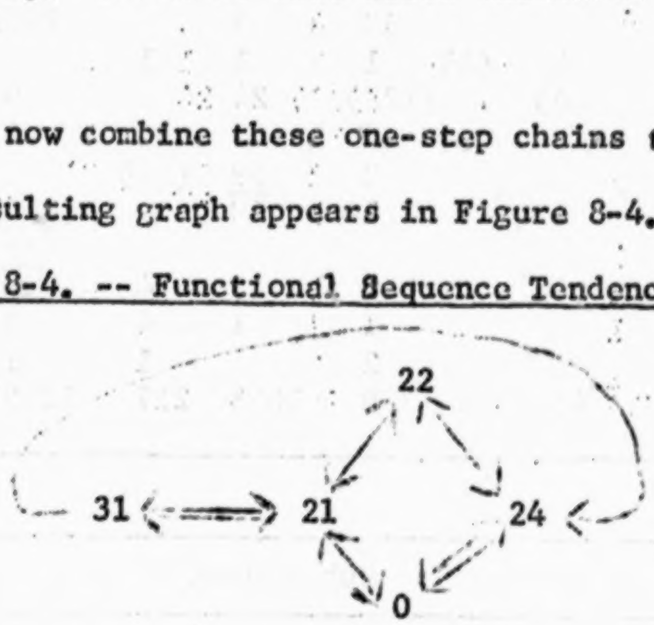

Figure 8-4 reveals a characteristic pattern of functional incidents. Lessons begin by considering their organization (0 ⟶ 24), then turn to information dissemination about relevant subject matter (24 ⟶ 21). Incidents of information dissemination about relevant subject matter are interrupted by excursions into intellectualization (21 ⟶ 31 ⟶ 21), and organization (21 ⟶ 24 ⟶ 21). Less often, non-relevant subject matter is taken up. Usually the lesson terminates 21 ⟶ 24 ⟶ 0, but if the final point was made with intellectualization, the sequence may be 31 ⟶ 24 ⟶ 0.

Figure 8-5. -- Sequential Analysis: Communication Structure For All Classrooms

		Subsequent								
	CS	1	2	3	4	5	6	7	8	9
Antecedent	1	5911*	4		120	(489)	38	104	2	19
	2	5	21*		3				(5)	5
	3			2*		1			3	
	4	110	5		6*	4	2	38	1	(135)
	5	(438)	2	1	4	453*	17	3		23
	6	83			3	7	83*	2		
	7	103			38	3		968*		9
	8	1	4	(3)	1	1	1		32*	2
	9	19	(6)		(122)	24		9	2	334*
	10	5			15		9	1		10
	11	24			2	59	(58)			1
	12	2	1		1	10		(141)		17
	13	1						19		
	14	2	3		11	6	4	1	3	110
	15	1			1	1	4	8		1
	0	11			2		1	1		4
	TOT	6716	45	6	329	1058	217	1295	48	670

		Subsequent							
	CS	10	11	12	13	14	15	0	TOT
Antecedent	1	2	16	7	1	2		(18)	6733
	2		1			3		3	46
	3								6
	4	15	2	2		8		1	329
	5		(96)	9		5	1	6	1058
	6	8	26			3		2	217
	7		1	(156)	6		8	4	1296
	8	1	1			5		1	53
	9	9	1	9		(129)	1	8	673
	10	9*			1	43		2	95
	11		132*	1	1	18	4		300
	12		1	182*	2		(55)	2	413
	13	1		2	21*		10	1	55
	14	(50)	21	3	4	280*	4	2	504
	15		1	40	(20)	6	64*	1	148
	0							13*	32
	TOT	93	299	411	56	502	147	64	11956

Communication Structure

Persistence. The matrix in Figure 8-5 shows, and the K scores in Figure 8-6 confirm, that there is a strong tendency for each kind of Communication Structure episode to be followed by another in which the code is the same. This tendency is not as strong as that found for functional episodes, however (K = .561 for communication structure, K = .696 for function).

More interesting, however, is the fact that there are proportionately more episodes observable during the existence of a central-group-only structure (code 1) than in any other case. There is only one other communications structure of any magnitude where external changes occur with notably greater frequency than internal change, and it too involves a central group. It is central plus non-involveds (code 7).

The Communication Structures of any magnitude for which incident change (Communication Structure change) occurs faster than episodic repetition (changes in other variable classes), are #4 (non-involveds only), #5 and #6 (central and a peripheral group), #10 (non-involveds + peripheral$_2$), and #12 (central + peripheral + non-involveds).

Predictability. The Lambda scores in Figure 8-6 indicate that over the whole sample, if the antecedent communication structure is known, that 40% of the error may be eliminated in predicting the subsequent (after deleting the major diagonal). Among the subsets of the sample, the two highest amounts of error elimination are to be found in sixth grade classes and in sixth grade classes with female teachers.

Figure 8-6. -- Persistence, Predictability and Reciprocity For Communications Structure

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity	
			(Chi Sq.)	(Z Transformation)
All classrooms	.561	.402	124.203	-0.30
1st Grade	.559	.357	67.390	-3.85
6th Grade	.558	.503	68.221	-3.78
11th Grade	.490	.381	69.838	-3.64
Mathematics	.559	.392	78.160	-2.96
Social Studies	.556	.420	80.191	-2.79
Younger Teachers	.535	.411	79.728	-2.83
Older Teachers	.577	.441	77.696	-2.99
Female Teachers	.561	.400	78.172	-2.96
Male Teachers	.557	.470	79.195	-2.87
Male 6th Gr. Teachers	.521	.466	48.014	-5.66
Female 6th Gr. Teachers	.534	.513	38.976	-6.63
Male 11th Gr. Teachers	.473	.400	51.870	-5.27
Female 11th Gr. Teachers	.547	.331	30.503	-7.65
				degrees of freedom=120.

The matrix in Figure 8-5 shows quite a degree of diversification among CS incidents. The highest loadings are distributed in a relatively catholic manner. The following conclusions about the major communication structures are warranted:

(i) An antecedent Central group (#1) is more likely to be followed by a central group + one peripheral group (#5) than all other communication structure conditions put together.

(ii) Non-involved incidents (#4) tend to be followed either by a peripheral group + non-involved structure (#9) or a central group only structure (#1).

(iii) A Central + peripheral group structure (#5) tends more often to revert to a Central group (#1) only but also to a lesser extent to become a Central group + two peripheral groups (#11).

(iv) A Central + peripheral (#6) structure tends mainly to revert to a central group only structure.

(v) A Central group + non-involveds (#7) tends to become first a central group + 2 peripheral groups (#12) and second a central group only.

(vi) A peripheral_1 + non-involved (#9) structure tends to become a non-involveds only (#14) structure.

(Vii) A central group + two peripheral (#11) tends to lose one or the other of its peripherals.

(viii) A central group + one peripheral group + non-involveds (#12) tends to lose the peripheral group but not the non-involveds (#7).

(ix) Two peripheral plus non-involveds (#14) tend to become one peripheral + non-involveds (#9 or #10).

Figure 8-7. -- Independent Variable Subset Comparisons For Communication Structure

Independent Variables	Predictability (Lambda)	Persistence (K)
1st vs. 6th	-5.24*	0.07
6th vs. 11th	4.71*	4.21*
1st vs. 11th	-0.79	3.87*
Math vs. S.S.	-1.23	0.19
-30 vs. +40	-1.38	-3.29*
F vs. M	-3.19*	0.30
M 6th vs. 11th	-1.97	2.30
F 6th vs. 11th	3.56*	-0.43
6th M vs. F	-1.36	-0.66
11th M vs. F	-1.37	-2.45*

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Reciprocity. The z transformations in Figure 8-6 are again for the most part negative in value which indicates that reciprocity is high. However, in contrast with the function data, the values of z scores are smaller, and in fact reach a positive value for all classrooms taken together. Thus there is generally less reciprocity among communication structure than among functional incidents.

Subset Comparisons

The subset comparisons show that higher predictability is to be found at grade 6 level than at either grade 1 or grade 11. Higher predictability is also to be found in classes with male teachers (although this is presumably a grade-artifact), and for sixth grade versus eleventh grade classes with female teachers.

A significantly higher persistence score is to be found in the case of grade 6 in comparison with grade 11 and grade 1 in comparison with grade 11. Classes with older teachers illustrate more persistence then those with younger teachers. Eleventh grade female teachers achieve higher persistence than do 11th grade male teachers.

Comment. Again if some liberties are again taken with the data it is possible to amalgamate a number of one-step sequences to form a single graphical picture of sequence tendencies in Matrix 8-5. This is presented in Figure 8-8.

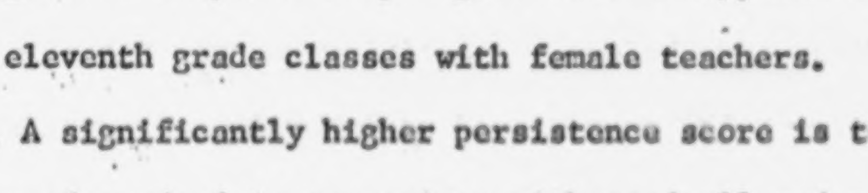

Figure 8-8. -- Communication structure sequence tendencies

As indicated in Figure 8-8, all communication structures lead to the "rome" of central group only (1), while the greatest reciprocation is between that structure and central group plus one peripheral group (5). Structure 5 may also reciprocate with 11 (two peripheral groups plus the central group), in which latter case its route back to the central group only structure may be either through the elimination of the second group (code 5), or the first group (code 6).

Two auxiliary branches also appear in the figure. The right-hand branch deals with sequences involving both central groups and non-involved persons. If a non-involved person appears (code 7), he either disappears or is joined by a peripheral group. If the latter, either the group disappears before the activity resumes a central-only structure (12—> 7 —> 1), or a second peripheral group appears (12 —> 15). This latter structure (15) has various diffuse ways of breaking down into other structures.

The left-hand branch deals with sequences involving no central group. When the central group ceases to exist, it is most likely to decay into a group of non-involved persons (1 —> 4), thereafter to non-involved persons plus a single peripheral group (4 —> 9), non-involved persons plus two peripheral groups (9 —> 14), and non-involved persons plus the second peripheral group (14 —> 10). Interestingly, the route back to the central group is to return through this same sequence (as if non-involvement appeared first when centralized activity ceased and was also the most legitimate terminal state before centralized activity was resumed).

The degree to which the three branches of Figure 8-8 are separated from one another in the data from Figure 8-5 is quite startling. There is good evidence here to indicate that "central group plus peripheral groups," "central group plus non-involved persons," and "non-involved persons" constitute genotypically distinct activity conditions of the classroom.

(1) The elimination of non-involveds who are in existence at the same time as a central group is preceded by the emergence of a peripheral group.

(2) If non-involveds are in existence at the same time as a secondary peripheral group, on the way to a central-group-only structure, another peripheral group emerges, the first disappears, so does the second before the non-involveds are converted to a central group only.

(3) No structure tends to become a central-group-only structure.

Role Allocation (Central Group)

Role allocation is the variable class which identifies the Emitter, Target and Audience members as either: Teacher (#1), Single Student (#2), Segment (#3), Quorum (#4), Teacher plus 1 Student (#5), Teacher plus Segment (#6), Teacher plus Quorum (#7).

Persistence. While there is a certain amount of persistence, evidence in the K scores of Figure 8-10, in comparison with the earlier variable classes, successive Role Allocation episodes do not tend to be characterized by the same role allocation.

Figure 8-9. -- Sequential Analysis: Role Allocation (Central) For All Classrooms

	Subsequent													
Ra.	101	103	104	107	113	114	120	122	123	124	130	133	134	140
101	*		2											
103		232*	11						(37)	3		3	2	
104	(2)	11	2065*		(2)		6		16	(467)		(8)	(10)	2
107				*										
113				1	*									
114						4*				1				
120		1	2				12*	(2)		1		1		
122							2	5*	1	1				
123		35	18				1		174*	9		4		
124		1	478	(1)		(1)	1	(2)	12	749*		2	5	2
130											1*			
133		5	2				1		5	3		10*		
134			10							9			6*	
140			2							1			1	*
143			1								(1)			
203														
204										4				
207			29						3	112				
210		1	7				1		1			1		
212			3				1		1					
213		(55)	15					1	16	3		6		
214		3	(862)			(1)	1		4	119			6	1
217										1				
220														
224			1							10				
226		1							1					
227			6							38			1	
241										2			1	1
253														
254			2							1				
304			1											
306		1	1						1					
307			1											
313		16	76						4	22		1		(3)
314			70							22			3	
324			1							1				
326			1											
327										4				
353									1			1		
410		1	14							2				
413			5							1				
504			5											
603		8	8						1	1				
604			7							3				
700			9											
703			4							1				
0		25	138				(9)		19	40	(1)	1	3	1
TOT	2	396	3866	2	2	6	35	10	297	1631	3	38	38	10

Antecedent

(Continued on next page)

Figure 8-9. (Continued)

Antecedent

	Subsequent														
Ra.	143	203	204	207	210	212	213	214	217	220	224	226	227	241	253
101															
103				1	1		(50)	1							
104				20	6		12	(884)			3		6		
107								1							
113															
114								1							
120					1	2	1	2							
122					1										
123				3		1	25	2				(1)			
124	(1)		(5)	(101)			2	161			(7)		16	(2)	
130							2								
133				1	1	1	4	3							
134			1	1	1			6						1	
140								4							
143	1*														
203		*	1	1				1							
204			8*	8				3			2				
207		(1)	(5)	125*				14	(2)		4		(30)	1	
210					30*	(7)	5								
212					5	26*	3	1							
213					(7)	1	199*	6				(1)			(1)
214		(1)	3	41	2	2	8	1025*					13		
217								1	*						
220										*					
224			1	3							9*		5		
226				1								1*			
227				11				11			3		75*		
241													2	4*	
253								1							5*
254			1												
304															
306															
307													1		
313		(1)		1			11	19							
314								15					1		
324								2							
326												(1)	1	1	
327				1				1				3	1		
353				1											
410															
413								2							
504								1							
603				1				2							
604															
700								1							
703															
0	(1)		1	15	5	1	7	30							
TOT	3	3	26	336	60	41	329	2201	2			28	4	153	10

(Continued on next page)

Figure 8-9. (Continued)

		Subsequent									
	Ra.	254	304	306	307	313	314	324	326	327	353
Antecedent	101										
	103			(2)		22					
	104			1		(98)	(66)	(2)			
	107					1					
	113										
	114										
	120										
	122										
	123					5					1
	124				(1)	8	19	1	(1)		(2)
	130										
	133										
	134										
	140					1					
	143										
	203										
	204										
	207	2							(1)	2	
	210										
	212										
	213					5	1				
	214	(3)	(1)			12	41	1	(1)	2	
	217										
	220										
	224										
	226										
	227				(1)				(1)	(7)	
	241										
	253										
	254	*									
	304		2*								
	306			*							
	307				*						
	313					55*	2				
	314					4	32*				
	324							*			
	326					1			*		
	327									2*	
	353										*
	410					1					
	413						1				
	504										
	603										
	604										
	700										
	703										
	0					1	1		(1)		
	TOT	5	3	3	2	214	163	4	5	13	3

(Continued on next page)

Figure 8-9. (Continued)

		Subsequent								
	Ra.	410	413	504	603	604	700	703	0	TOT
Antecedent	101									2
	103	1			(10)				20	396
	104	(16)	(5)	(4)	.5	(10)	(9)	(6)	(135)	3877
	107									2
	113								2	3
	114									6
	120								10	35
	122									10
	123								20	299
	124				2				52	1635
	130								2	5
	133								2	38
	134								3	38
	140								1	10
	143									3
	203									3
	204									25
	207				1				4	336
	210								7	60
	212								2	42
	213								13	330
	214			2	1		1		44	2201
	217									2
	220									
	224									29
	226									4
	227								1	155
	241									10
	253									6
	254									4
	304									3
	306									3
	307									2
	313		1		1					213
	314		3						4	163
	324									4
	326									5
	327									12
	353									3
	410	3*								21
	413		1*							10
	504			*						6
	603				2*			1		24
	604					*		2		12
	700						4*			14
	703				1	2		*		8
	0	1							1432	1733
	TOT	21	10	6	23	12	14	9	1754	11956

Once again, however, the variables that are associated with external changes (coincidental changes in other variable classes) can be identified. There are only three, and the amount of external change they evidence is not extensive. They are:

(1) 103 (teacher emitter, no target, segment audience)

(2) 123 (teacher emitter, single pupil target, segment audience)

(3) 213 (single pupil emitter, teacher target, segment audience)

Common to all of them (understandably) is the existence of a segment audience.

Predictability. The Lambdas in Figure 8-10 indicate that if the antecedent incident is known, some 31% of error can be eliminated in predicting the subsequent incidents. The two sub-sets of the sample to achieve highest predictability were: eleventh grade classes (44%) and eleventh grade classes with male teachers (42%).

Reciprocity. The z transformations in Figure 8-10 are all highly negative and larger than those for function. The inference is that the probability of any role allocation state leading to another is almost identical with the probability of the inverse sequence. However, some patterning among the variables is apparent. An examination of the individual variables in the matrix (Figure 8-9) leads to the conclusion that the following antecedent-subsequent relations tend to occur.

103 (teacher emitter, no target, segment audience)—>213
(single student emitter, teacher target, segment audience)

104 (teacher - no - quorum)—>#214 (single student - teacher - quorum)

—> #124 (teacher - single student - quorum)

123 (teacher - single student - quorum)—> #103 (teacher - no - segment

Figure 8-10. -- Persistence, Predictability and Reciprocity For Role Allocation (Central)

	Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
Antecedent	All classrooms	.426	.310	224.750	-25.28
	1st Grade	.303	.196	129.617	-30.39
	6th Grade	.520	.308	114.691	-31.34
	11th Grade	.388	.438	65.984	-35.00
	Mathematics	.455	.311	110.421	-31.63
	Social Studies	.380	.324	183.849	-27.31
	Younger Teachers	.459	.284	155.874	-28.83
	Older Teachers	.388	.347	133.699	-30.13
	Female Teachers	.415	.258	170.271	-28.03
	Male Teachers	.433	.386	96.944	-32.56
	Male 6th Gr. Teachers	.463	.358	61.069	-35.43
	Female 6th Gr. Teachers	.541	.284	68.336	-34.80
	Male 11th Gr. Teachers	.379	.416	50.892	-36.40
	Female 11th Gr. Teachers	.413	.552	28.455	-38.94
					degrees of freedom=1081.

Figure 8-11. -- Independent Variable Subset Comparisons
Role Allocation (Central)

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	-4.66*	-15.29*
	6th vs. 11th	-5.50*	- 9.71*
	1st vs. 11th	-9.96*	- 5.81*
	Math vs. S.S.	-0.66	6.58*
	-30 vs. +40	-3.11*	6.23*
	F vs. M	-6.42*	- 1.59
	M 6th vs. 11th	-1.94	4.72*
	F 6th vs. 11th	-6.48*	5.21*
	6th M vs. F	2.24	- 4.09*
	11th M vs. F	-3.52*	- 1.48

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

124 (teacher - single student - quorum) #104 (teacher - no - quorum)

207 (single pupil - no - T + quorum) #124 (teacher - single student - quorum)

#227 (single pupil - single pupil - T + quorum)

213 (single student - T - segment) #103 (T - no - segment)

214 (single student - T - quorum) #104 (T - no - quorum)

227 (single student - single student - T + quorum) #124 (T - single pupil - quorum)

313 (segment - T - segment) #103 (T - no - segment)

314 (segment - T - quorum) #104 (T - no - quorum)

Sub-set comparisons. Figure 8-11 shows that when comparisons are made between the sub-sets of the sample there are seven cases of significant difference in predicting incident predictability, and seven in predicting episode persistence. They are, respectively,

Predictability

6th grade classes over 1st grade classes

11th grade classes over 6th grade classes

Older Teachers over Younger Teachers

Male Teachers over Female Teachers (artifact)

Female 11th grade teachers over female 6th grade teachers

Female 11th grade teachers over male 11th grade teachers

Persistence

6th grade classes over 1st grade classes

6th grade classes over 11th grade classes

11th grade classes over 1st grade classes

Mathematics classes over Social Studies classes

Younger Teachers over Older Teachers

Male 6th grade teachers over Male 11th grade teachers

Female 6th grade teachers over Female 11th grade teachers

Female 6th grade teachers over Male 6th grade teachers

Comment. If some liberties may again be taken with the data, it is possible to construct a graph of role allocation sequence tendencies that are similar to those derived for function and communication system structure data.

Such a graph is displayed in Figure 8-12.

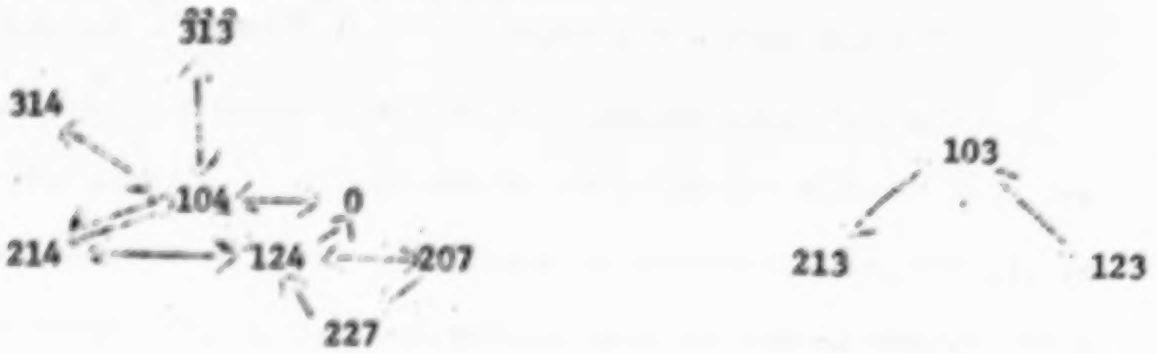

Figure 8-12. -- Role Allocation Sequence Tendencies

In contrast with previous graphs, this figure is composed of two structures that are distinct. The larger of the two graphs concerns role allocations involving a quorum of the classroom. Again, the center of this graph appears to be role allocation 104 (teacher plus audience) which reciprocates often with two other allocations, 124 (teacher, target pupil, audience) and 214 (emitter pupil, teacher target, audience). Although these latter may reciprocate with one another, they are more likely to reciprocate with structure 104. (Parenthetically, the disconnected graph at the right-side of Figure 8-12 shows an identical picture for central groups whose audience is composed of only a segment of the classroom).

Three other structures also reciprocate with 104: 314 (segment emitter, teacher target, quorum audience), 313 (segment emitter, teacher target, segment audience), and 0 (no central group). Evidently the teacher enters the role of target exclusively from that of targetless emitter, and to that high estate returns after pupil emission has been taken care of. An interesting branch also appears to be related to 124 (teacher, pupil target, quorum audience). This structure reciprocates with 207 (pupil emitter, teacher plus quorum audience). But the return to 124 may either be direct or via 227 (pupil emitter, pupil target, teacher plus quorum audience). Evidently it is difficult for the teacher to enter an audiential role without first entering a colloquy with a target pupil (who presumably becomes the emitting pupil in the next incident).

Role Structure (Central Group)

Role structure is concerned with the number and distribution of roles at any given time. Specifically it differentiates between #1 audience only, #2 emitter plus audience, #3 emitter plus target plus audience, #4 emitter plus target, and #5, emitter only.

Persistence. The K scores show that there is not a marked tendency for an episode to be followed in Figure 8-14 by another episode in which the role structure is still the same. This implies that there is relatively less external (incident) change occurring coincidentally with internal (episode) change than in the cases of the preceding variable classes. However, the matrix does show that, proportionately, slightly more than external change is associated with the emitter + target + audience structure than with any of the other codes.

Figure 8-13. -- Sequential Analysis: Role Structure (Central) For All Classrooms

		Subsequent						
	RS	1	2	3	4	5	0	TOT
Antecedent	1	102*	3	3				108
	2	(4)	2609*	(1897)	32	(9)	(159)	4710
	3	2	(1869)	3206*	(34)	1	145	5257
	4		28	38	50*		20	136
	5		9	1		4*		14
	0		180	105	18		1432*	1735
	TOT	108	4698	5250	134	14	1756	11956

Figure 8-14. -- Persistence, Predictability and Reciprocity For Role Structure

	Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
Antecedent	All classrooms	.396	.773	8.846	-1.18
	1st Grade	.263	.741	5.925	-1.94
	6th Grade	.531	.721	1.856	-3.46
	11th Grade	.334	.831	6.894	-1.67
	Mathematics	.419	.735	3.873	-2.60
	Social Studies	.353	.814	9.075	-1.12
	Younger Teachers	.473	.726	7.807	-1.43
	Older Teachers	.305	.813	4.915	-2.25
	Female Teachers	.421	.750	4.883	-2.26
	Male Teachers	.361	.797	5.882	-1.95
	Male 6th Gr. Teachers	.413	.694	2.664	-3.08
	Female 6th Gr. Teachers	.612	.756	0.089	-4.96
	Male 11th Gr. Teachers	.319	.842	5.882	-1.95
	Female 11th Gr. Teachers	.383	.801	2.427	-3.18
					degrees of freedom=15.

Predictability. The Lambdas in Figure 8-14 indicate that knowing an antecedent structure permits the elimination of a considerable amount of error in predicting the next structure, after deleting the major diagonal. This finding is an artifact however, and reflects merely that codes #2 and #3 are both heavily loaded on and tend to predict to one another. The highest percentage of error elimination (81%) was registered by the classes which had older teachers -- the corresponding Lambda for all classrooms was .773 or 77%.

Reciprocity. The z transformations in Figure 8-14 are all negative in sign, though small in value, and we cannot reject the null hypothesis of symmetry for role structure matrices. An examination of the matrix in Figure 8-13 leads to the following interpretations. There are two variables, #2 (emitter + audience), and #3 (emitter + target + audience), which account for the vast majority of incidents. There is high probability that an emitter + audience structure will be followed by an emitter + target + audience structure. The probability is almost as high that an emitter + target + audience structure will be followed by an emitter + audience structure. No role structure is likely to be followed by an emitter + audience structure or (to a lesser extent,by an emitter + target + audience structure).

Sub-set comparisons. In all cases except one (male 11th grade teachers contrasted with female 11th grade teachers), significant differences between the sub-sets of the sample were found in predicting persistence. Figure 8-15 provides the details. Figure 8-15 also shows that in predicting predictability, the following significant differences were achieved:

Figure 8-15. -- Independent Variable Subset Comparisons
Role Structure

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	0.80	-14.51*
	6th vs. 11th	-4.87*	12.14*
	1st vs. 11th	-4.26*	- 3.77*
	Math vs. S.S.	-4.42*	4.60*
	-30 vs. +40	-4.76*	11.85*
	F vs. M	-2.60*	4.24*
	M 6th vs. 11th	-5.08*	4.19*
	F 6th vs. 11th	-1.12	7.95*
	6th M vs. F	-1.64	- 8.59*
	11th M vs. F	1.31	- 2.26

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

11th grade over 6th grade

11th grade over 1st grade

Social studies over Mathematics

Older teachers over Younger teachers

Male teachers over Fhmale teachers (artifact)

Male 11th grade teachers over Male 6th grade teachers

Comment. Following the earlier convention, it is possible to discern among these data, sequential patterns. Figure 8-16 portrays them.

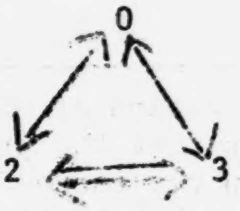

Figure 8-16. -- Role Structure Sequence Tendencies

Generally, Figure 8-16 adds little to our previous insights. Categories 2 (emitter plus audience) and 3 (emitter, target, and audience) reciprocate with one another and with 0 (no central group).

Non-Involved Role Allocation.

Non-involved actors may be identified as: teacher, one pupil, a segment, the quorum, teacher plus one pupil, teacher plus segment, and teacher plus quorum.

Persistence. The K scores, which range between .699 and .845 with a K of .793 for the whole sample in Figure 8-18, indicate that there is a strong probability that a given episode will be followed by another in which the non-involved actors' identity is the same. It also means that the rate of change in incidents defined by the non-involved actors' role allocation is lower than is the rate of change manifested by the other variable classes. To put it in other words, the non-involved actors stay non-involved while other changes, structural or functional occur about them.

Predictability. The Lambda for all classrooms shows that when the major diagonal is eliminated, if the antecedent is known, 36% of the error can be eliminated in predicting the subsequent identity of non-involved actors. Greatest predictability is to be found among male 11th grade teachers -- Lambda = .544 or 54%.

An examination of the individual variables shows that with three exceptions, any non-involved actors tend to be followed by no non-involved actors. The three exceptions are:

#4 A quorum of non-involved actors tends to be joined by the teacher.

#6 If the teacher plus a segment is non-involved, the teacher becomes involved but a non-involved segment remains.

#0 No non-involved actors tend to be replaced by all non-involved actors (first) and a segment (second).

Reciprocity. All the z transformations were negative which indicates that the two halves of the matrix in Figure 8-17 are approximately the same. In a given pair of variables, either one tends to be the antecedent as frequently as it tends to be the subsequent.

Sub-set comparisons. Figure 8-19 shows that predicting predictability is better for: eleventh grade teachers compared with sixth grade; eleventh grade compared with first grade; male eleventh grade teachers compared with male sixth grade teachers; and female sixth grade teachers compared with male sixth grade teachers.

Figure 8-19. -- Independent Variable Subset Comparisons
Non-involved Role Allocation

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	0.79	-7.56*
	6th vs. 11th	-4.50*	8.99*
	1st vs. 11th	-3.80*	2.64*
	Math vs. S.S.	0.15	-1.88
	-30 vs. +40	1.75	-7.77*
	F vs. M	-1.54	-6.86*
	M 6th vs. 11th	-5.33*	7.87*
	F 6th vs. 11th	-0.38	3.35 *
	6th M vs. F	-2.68*	2.31
	11th M vs. F	1.48	-1.12

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Predicting persistence is better for:

6th grade teachers compared with 1st grade teachers

6th grade teachers compared with 11th grade teachers

1st grade teachers compared with 11th grade teachers

Older teachers compared with Younger teachers

Male teachers compared with Female teachers (artifact)

Male 6th grade teachers compared with Male 11th grade teachers.

Female 6th grade teachers compared with Female 11th grade teachers.

Comment. While there is perhaps less reason for anticipating sequence among non-involved actors, the idea of behavioral contagion suggests the possibility that the existence of non-involved actors leads to other structural (and perhaps functional) consequences.

Constructing a graphical diagram leads to the following interpretation.

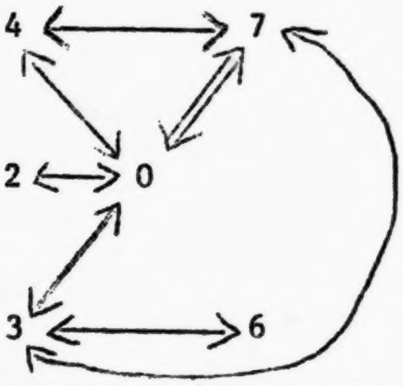

Figure 8-20. -- Non-involved role allocation sequence tendencies.

At the center of the graph in Figure 8-20 is, of course, code 0 representing the overwhelming preponderance of incidents in which there were no non-involved persons. With this condition, non-involved pupils (code 2), pupil segments (code 3) and pupil quorums (code 4) are likely to reciprocate. Non-involvement of a pupil segment is also likely to bring in the teacher (3→6) and vice versa; non-involvement of a pupil

Figure 8-21. -- Sequential Analysis: Teacher Role Assignment For All Classrooms

		Subsequent										
	T.R.A.	1	2	3	4	5	6	7	8	9	0	TOT
Antecedent	1	(4576)*	(1430)	(168)	16	8					243	6441
	2	(1375)	(1548)*	63	5	3					72	3066
	3	216	34	(340)*	14	2	3				11	620
	4	16	4	20	(332)*	(97)	(11)				62	542
	5	3	1	4	(92)	(185*	3				57	345
	6			2	(13)	3	2*				1	21
	7							*			1	1
	8								*			
	9							(1)		*		1
	0	(238)	46	22	66	44	2			1	(504)*	923
	TOT	6424	3063	619	538	342	21	1		1	951	11956

quorum is likely to bring in the teacher (4→7) and vice versa. Finally, since a pupil quorum plus the teacher is (by definition) everyone in the classroom, this state (7) also reciprocates with lack of non-involved persons (code 0).

Teacher Role Assignment.

The variable class Teacher Role Assignment describes whether the teacher is emitter, target or audience member in either the central group or one of the two peripheral groups.

Persistance. The K score in Figure 8-22 evidence quite an amount of variability among the sub-sets of the sample. They range from .272 for first grade to .505 for female sixth grade teachers. However, the K of .409 for the whole sample means that there is only a moderate probability that successive episodes will have the same teacher role assignment. It also implies that change in structural and functional variables does not proceed independently of changes in teacher role assignment. Inspection of the table, however, reveals one very interesting phenomenon -- namely, that this tendency is maximized when the teacher is not the emitter. It is much less apparent when he is in the emitter role.

Predictability. The Lambdas in Figure 8-22 imply that if the teacher's role is known at any particular moment, his next role can be predicted with some confidence, once the repeated episodes are deleted. The Lambda for all classrooms indicates that some 62% of the error can be eliminated in making such a prediction. For female eleventh grade teachers the percentage of error eliminated is 76%.

The matrix in Figure 8-21 provides more detail on the specific variables. It is obvious that if the teacher is emitter in the central

Figure 8-22. -- Persistence, Predictability and Reciprocity for Teacher Role Assignment

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	Reciprocity (Z Transformation)
All classrooms	.409	.615	35.936	-0.96
1st Grade	.272	.618	15.619	-3.84
6th Grade	.485	.619	10.040	-4.95
11th Grade	.402	.677	22.038	-2.79
Mathematics	.443	.596	20.069	-3.10
Social Studies	.367	.663	22.917	-2.66
Younger Teachers	.452	.619	27.561	-2.01
Older Teachers	.358	.630	15.330	-3.90
Female Teachers	.393	.593	17.872	-3.45
Male Teachers	.424	.668	28.981	-1.82
Male 6th Gr. Teachers	.419	.723	8.154	-5.40
Female 6th Gr. Teachers	.505	.562	5.567	-6.10
Male 11th Gr. Teachers	.420	.652	23.781	-2.54
Female 11th Gr. Teachers	.332	.758	5.048	-6.26
				degrees of freedom=45.

group, he is likely to be next a target in the central group. If he is target, he is likely to become emitter next. If he is an audience member, he is also likely to become emitter in the central group. If he is involved in the initial peripheral group as emitter, he is likely to become a target and vice versa. As an audience member in the peripheral group he is likely to become emitter next. His role in the second peripheral group is minimal. However, he is much more likely to engage in the emitter then target, or target then emitter sequences in the central group than he is any other. Interestingly,he is most likely to have no role allocation after he has been emitter in the central group. After he has had no role he is more likely to be emitter in the central group again.

Reciprocity. Inspection of Figure 8-22 leads to the conclusion that there is a considerable amount of symmetry in the figure, and indeed the z transformations of chi-square are negative in sign though not as large as for some matrices. The major departures from symmetry lie in the fact that:

(i) Target in the central group follows emitter in the central group more often than vice versa.

(ii) Audience member in the central group follows emitter in the central group less often than vice versa.

(iii) That no role follows both emitter in the central group and target in the peripheral group than vice versa.

(iv) That no role is followed by an audience role more than vice versa.

Sub-set comparisons. Figure 8-23 shows that it is possible to predict a subsequent incident from an antecedent better for: social studies classes than mathematics classes; male teachers than female

Figure 8-23. -- Independent Variable Subset Comparisons
Teacher Role Assignment

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	-0.03	-11.56*
	6th vs. 11th	-2.39	5.20*
	1st vs. 11th	-2.29	- 6.78*
	Math vs. S.S.	-3.20*	5.39*
	-30 vs. +40	-0.52	6.72*
	F vs. M	-3.50*	- 2.21
	M 6th vs. 11th	2.23	- 0.03
	F 6th vs. 11th	-5.08*	5.99*
	6th M vs. F	4.65*	- 3.76*
	11th M vs. F	-2.92*	3.06*

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

teachers; female sixth grade teachers than female eleventh grade teachers; male sixth grade teachers than female sixth grade teachers; and female eleventh grade teachers than male eleventh grade teachers.

Figure 8-23 also reveals that there are significant differences in persistence in all cases except the comparisons between male and female teachers and between male sixth and eleventh grade teachers.

Comment. There are two distinctive sequence branches to be found among the data. These are similar except for the fact that one relates to the central group the other to the primary peripheral group.

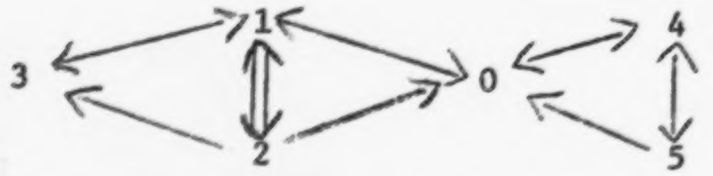

Figure 8-24. -- Teacher role assignment sequence tendencies.

In Figure 8-24 the left-hand branch deals with teacher role in the central group. Emitter (1) and target (2) roles reciprocate with high frequency, emitter and audience (3) roles somewhat less often. Interestingly, the teacher is less likely to pass from an audience role to a target role than vice versa, and he is also less likely to assume the target role when first entering the group than he is to leave the group (0) after being a target. The right-hand branch of the figure reports information for teacher roles in the first peripheral group. It is identical with the left-hand branch except that the teacher seldom plays an audiential role in peripheral groups.

Teacher Location

Persistence. The moderate K scores in Figure 8-26 indicate that a fair amount of other activity changes are occuring while the teacher

Figure 8-25. -- Sequential Analysis: Teacher Location For All Classrooms

Antecedent	Subsequent									
T.L.	11	12	13	14	15	16	21	22	23	24
11	798*							(2)	6	(323)
12		*								
13			*							
14				*						
15					*					
16						*				
21							1*			2
22								1*	5	2
23	6							(2)	124*	77
24	(303)						(2)	(2)	(74)	5755*
25	36								1	139
26	1									6
31										
32	8							(2)	10	8
33	12								8	18
34	53						1		2	106
35	6								1	10
36	18								1	7
41										
42									1	
43	6									7
44	35								1	24
45	12									11
46	10									1
51										
52	15									1
53	1									1
54	92									10
55	15									6
56	5									
61										
62										
63										
64	6									1
65	8									
66	1									
99										
0	23								1	42
TOT	470						4	9	235	6557

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Figure 8-25. (Continued)

Antecedent	Subsequent									
T.L.	25	26	31	32	33	34	35	36	41	42
11	35	2		5	9	51	(9)	12		3
12										
13										
14										
15										
16										
21										
22				1						
23	1			7	8	5	2			1
24	(145)	2		(14)	(13)	(119)	8	13		1
25	289*	9				5	(9)	(38)		
26	6	21*						9		
31			*							
32				80*						(14)
33	1				30*	8		1		
34	3			3	10	546*	4	3		
35	7				1	6	36*	2		
36	40	(11)			1	2	3	167*		
41									*	
42				13	2					47*
43				1	8	1				3
44	1				3	46	1	5		
45	2					1	3	1		
46	1							23		
51										
52										7
53						2				
54						2		1		
55		1				1		1		
56								1		
61										
62										
63										
64										
65								1		
66										
99										
0	5				1	7		4		
TOT	536	46		124	86	802	75	282		76

(Continued on next page)

Figure 8-25. (Continued)

Antecedent T.L.	Subsequent 43	44	45	46	51	52	53	54	55	56
11	4	27	(14)	(10)		(15)	2	(92)	(11)	6
12										
13										
14										
15										
16										
21									1	
22										
23	(8)	26	6	1			1	11	6	1
24		2	5	1					1	
25				1						
26										
31										
32	2									
33	7	1								
34	2	(58)						3	1	
35		1	3							
36		4	1	(22)						1
41										
42	3					9				
43	227*	8					2	1		
44	8	154*	3	1				27	1	
45		3	165*	1					4	
46		1	2	48*				2		(7)
51					*					
52						33*	1			
53	3	1					3*	3		
54		22	1				(4)	166*	3	1
55		1						2	17*	
56			1	9					1	34*
61		1								
62										
63							1			
64			1					4		1
65										
66										
99										
0	2	3	1	2		1	1	4		
TOT	266	312	203	96		58	15	315	46	51

(Continued on next page)

Figure 8-25. (Continued)

		Subsequent								
	T.L.	61	62	63	64	65	66	99	0	TOT
Antecedent	11				4	(8)	1		25	1474
	12									
	13									
	14									
	15									
	16									
	21									4
	22									9
	23								3	236
	24				1				(60)	6572
	25								4	539
	26								3	47
	31									
	32									124
	33									86
	34				1				6	802
	35								2	75
	36								5	283
	41									
	42								1	76
	43								2	266
	44								2	312
	45									203
	46								1	96
	51									
	52								1	58
	53			(1)						15
	54				(10)				4	315
	55					1				46
	56									51
	61	*								
	62		*							
	63			1*	1				1	4
	64			(1)	18*	3			2	37
	65					24*	(2)		3	38
	66					1	1*		1	4
	99							*		
	0				1				73*	171
	TOT			3	36	37	4		199	11956*

Figure 8-26. -- Persistence, Predictability and Reciprocity For Teacher Location

	Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	Reciprocity (Z Transformation)
Antecedent	All classrooms	.616	.236	97.754	-23.50
	1st Grade	.536	.282	62.868	-26.27
	6th Grade	.687	.252	73.785	-25.33
	11th Grade	.526	.245	51.495	-27.33
	Mathematics	.603	.211	84.890	-24.45
	Social Studies	.626	.277	66.497	-25.95
	Younger Teachers	.616	.203	67.764	-25.84
	Older Teachers	.609	.292	92.460	-23.88
	Female Teachers	.601	.251	82.684	-24.62
	Male Teachers	.628	.236	46.907	-27.80
	Male 6th Gr. Teachers	.730	.259	39.143	-28.63
	Female 6th Gr. Teachers	.633	.243	53.536	-27.14
	Male 11th Gr. Teachers	.511	.280	36.911	-28.89
	Female 11th Gr. Teachers	.588	.278	25.553	-30.33
					degrees of freedom=703.

occupies one location. The great number of frequencies in cell 24 + 24 makes a major contribution to this finding. On an average, seven structural or functional changes occur during each period that the teacher occupies location #24. Interestingly enough, the rate of episodes drops dramatically once the teacher moves away from the front of the room.

Predictability. Knowing the teacher's location permits the elimination of 62% of the error in predicting his next location, once repeated episodes are deleted. In sixth grade classes with male teachers the percentage runs to 73%.

The locations occupied to any great extent by teachers are the three adjacent front of the room locations (#23, #24, and #25) and a narrow band of locations stretching back from the center front viz., #34, #44, and #54. Location #11 (diffuse, diffuse) is also used to some extent and so is #0 (out of the room).

An examination of Figure 8-25 shows that if a teacher is moving around the room, or is out of the room, or is at location #34, then he is likely to be back in the front of the room next, #24. However, if he is at #44 he is more likely to go to #34 next, and if he is at #54 he is likely to be mobile (#11) next.

To reverse the perspective and to consider where a teacher is likely to have come from shows that if he is at #24, it is more likely that he has been moving about the room rather than occupying any distinct location. If he is perambulating, it is also likely that he has come from #24. This is so for #34, too. If he is at #44 he probably came from #34, but if he is at #54 he probably was in process of walking about in general.

Figure 8-27. -- Independent Variable Subset Comparisons
Teacher Location

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	1.03	- 9.88*
	6th vs. 11th	0.24	10.70*
	1st vs. 11th	1.23	0.54
	Math vs. S.S.	-2.73*	- 1.89
	-30 vs. +40	-3.65*	0.53
	F vs. M	0.60	- 2.22
	M 6th vs. 11th	-0.54	12.12*
	F 6th vs. 11th	-0.59	1.48
	6th M vs. F	0.40	5.65*
	11th M vs. F	0.05	- 2.44

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Reciprocity. The z transformations in Figure 8-26 are all large and negative and assert a high degree of symmetry in the table. Compared with the earlier tables, there is considerable tendency for teacher locations to be equally antecedent and subsequent to one another.

Sub-set comparisons. Figure 8-27 shows that it is easier to predict the subsequent location from knowing the antecedent in the case of social studies classes compared with mathematics classes and older teachers compared with younger ones. There is also a significant difference in persistence which favors: sixth grade over first grade; sixth grade over eleventh grade; male sixth grade teachers over male eleventh grade teachers; and male sixth grade teachers over female sixth grade teachers.

Comment. The data show that if the teacher settles in any place he is likely to settle at the front of the room. Thereafter he is most likely either to go on safari about the room (without interacting with the pupils) or else have brief exchanges with pupils immediately in front of him. Again a kind of flow chart of sequences can be fabricated from the data. The resulting pattern is portrayed in Figure 8-28 below.

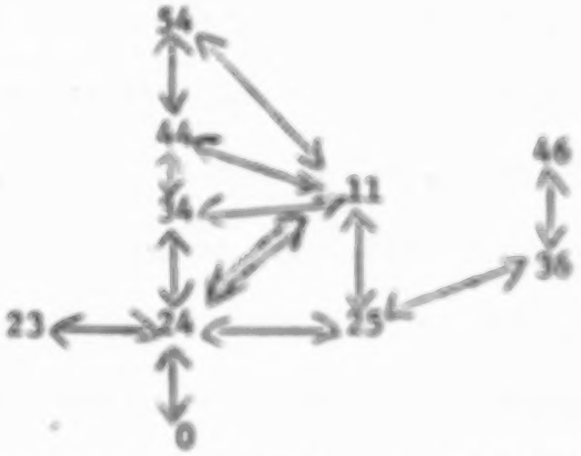

Figure 8-28. -- Teacher location sequence tendencies.

Emitter Location (Central Group)

Persistence. The middle range Z scores in Figure 8-30 show that there are more other types structural and functional change occurring (but not much more) during the individual emittance than there is change in the location of the emitter. However, an examination of Figure 8-29 reveals some distinctly idiosyncratic characteristics. For instance, while the emitters are diffusely located there are on the average approximately three changes per episode. However, when the emitter is located at #24 there is an average of half an external change per episode. When the emitters are located at #34, #44 and #54, the ratio of internal change to external change becomes approximately 2:3.

Predictability. Unlike any of the preceding sequential analyses, predictability for this variable class is low. Knowing the location of the preceding emitter permits the elimination of only a small part of the error in predicting the location of the succeeding one. The Lambda for the whole group is .103 or 10%.

However, some consistent patterns are thrown up among the individual variables. For instance, if the previous emitter was diffusely located (#11) then the next one will most likely be at #24 (center front). If he is at the center front first, the next location is likely to be either at #34 (first), #11 (next), #44 (next) or #54 (next). If he is at #34, #44 or #54, then the next most likely location of the emitter is #24. The following relationships occur more frequently: #24 ↔ #34, #24 ↔ #11, #24 ↔ #44, #24 ↔ #54, #0 ↔ #24.

Reciprocity. The z transformation in tables are all large and negative. From this it can be concluded that there is a high degree of

Figure 8-29. -- Sequential Analysis: Emitter Location (Central) For All Classrooms

	Subsequent									
Antecedent E.L.	11	12	13	14	15	16	21	22	23	24
11	127*								7	215
12		*								
13			*							
14				*						
15					*					1
16						*				
21							*			
22								*	2	
23	7								68*	61
24	(208)							(1)	(60)	3130*
25	16								1	110
26										6
31										
32	3							(1)	8	5
33	9								13	80
34	26								6	(290)
35	4								3	39
36	3								2	6
41										
42									[illegible]	[illegible]
43	21									66
44	24									173
45	2									22
46	2									4
51										
52	2									
53	6									19
54	25								1	122
55	6				(1)					66
56	3									
61										
62										
63										1
64										1
65										
66										
99	11								2	112
0	4							(1)	5	157
TOT	509				1			3	183	4702

(Continued on next page)

Figure 8-29. (Continued)

Antecedent

	Subsequent									
T.L.	25	26	31	32	33	34	35	36	41	42
11	20			2	4	29	10	4		1
12										
13										
14										
15										
16										
21										
22				1						
23				5	12	6	4			1
24	(112)			(10)	(86)	(296)	(29)	9		3
25	146*	(7)			4	17	10	(30)		
26	2	5*					1	7		
31			*							
32				30*	4	5	5			(11)
33	4			3	90*	16	2	6		
34	15			7	17	424*	14	10		2
35	14			4		12	74*	4		
36	32	(7)			4	11	3	107*		
41									*	
42				9	2	2				20*
43	3			1	10	21	1	7		2
44	8	1		5	3	73	5	7		
45	1				7	15	14	2		
46	3				3	5		21		
51										
52										4
53	2				2	11				
54	5			2	3	22	3	5		2
55	1	1			1	5	1	2		
56										
61										
62										
63										
64										
65										
66								1		
99	4	1		2	5	13	2	2		
0	14	1		3	9	32	6	6		1
TOT	386	23		84	266	1015	184	230		47

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Figure 8-29. (Continued)

	Subsequent									
E.L.	43	44	45	46	51	52	53	54	55	56
11	14	24	3	1		1	5	18	3	2
12										
13										
14			1							
15										
16										
21										
22										
23	3	4						2		
24	(64)	(181)	(59)	6			(19)	(135)	(51)	1
25	3	9	2	3			4	4	3	
26				1						
31										
32	1	3					1	2		
33	8	7	8	2			3	5	1	
34	25	64	9	3		2	11	21	7	1
35	1	6	11	1			1		1	
36	8	10	1	(17)			2	5	1	
41										
42	1					(6)		4		
43	116*	10	8	1			4	11		
44	8	230*	19	1			4	30	3	
45	9	19	93*	1			2	1	4	
46		2	1	46*				3		(6)
51					*					
52		1				8*	3	2		
53	7	4	1			2	59*	8	5	
54	12	27	4	1		2	7	205*	8	
55	2	3	3	1			2	9	65*	3
56	1			2					6	16*
61										
62										
63							1			
64								3		1
65				3				1		
66				1						
99	9	11	3	5			2	6	1	
0	3	15	8	3		(6)	2	16	2	1
TOT	295	630	233	99		27	132	491	161	31

(Continued on next page)

Figure 8-29. (Continued)

		Subsequent								
	E.L.	61	62	63	64	65	66	99	0	TOT
Antecedent	11							14	5	509
	12									
	13									
	14									
	15									1
	16									
	21									
	22									3
	23							4	5	182
	24				1			(101)	(153)	4715
	25							3	15	387
	26							1		23
	31									
	32							1	4	84
	33							3	7	267
	34				1			26	35	1016
	35							3	6	184
	36							1	9	229
	41									
	42								1	47
	43							9	5	296
	44					1		9	23	641
	45							4	4	233
	46							4		100
	51									
	52								7	27
	53			(1)		1			4	132
	54				(8)	1		8	18	491
	55							3	6	161
	56							1	2	31
	61	*								
	62		*							
	63			*					1	3
	64				3*	3	1	2	2	16
	65					11*	(3)		4	22
	66					1	2*	1	1	7
	99							70*	14	275
	0			(1)	2	(4)	1	7	1534*	1844
	TOT			2	15	22	7	275	1865	11956*

Figure 8-30. -- Persistence, Predictability and Reciprocity For Emitter Location (Central)

	Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity	
				(Chi Sq.)	(Z Transformation)
Antecedent	All classrooms	.452	.102	136.922	-20.93
	1st Grade	.360	.154	90.244	-24.05
	6th Grade	.536	.081	101.177	-23.26
	11th Grade	.397	.147	90.499	-24.03
	Mathematics	.509	.131	107.208	-22.84
	Social Studies	.390	.097	118.183	-22.11
	Younger Teachers	.499	.086	99.147	-23.40
	Older Teachers	.397	.129	120.387	-21.97
	Female Teachers	.433	.101	127.359	-21.52
	Male Teachers	.470	.107	86.969	-24.29
	Male 6th Gr. Teachers	.517	.128	69.349	-25.71
	Female 6th Gr. Teachers	.541	.097	79.245	-24.89
	Male 11th Gr. Teachers	.424	.141	72.160	-25.47
	Female 11th Gr. Teachers	.295	.174	54.294	-27.06

763

Figure 8-31. -- Indpendent Variable Subset Comparisons
Emitter Location (Central)

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	3.20*	-12.02*
	6th vs. 11th	-3.01*	10.34*
	1st vs. 11th	.28	- 2.43
	Math vs. S.S.	1.75	10.44*
	-30 vs. +40	-2.24	8.93*
	F vs. M	-0.29	- 3.18*
	M 6th vs. 11th	-0.50	5.36*
	F 6th vs. 11th	-1.94	9.83*
	6th M vs. F	1.07	- 1.32
	11th M vs. F	-0.84	5.35*

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

correspondence between the two halves of the table and that any given variable is as likely to precede any other variable as much as it is likely to succeed it.

Sub-set comparisons. Only two instances of significant differences in predictive power are revealed in the sub-set comparisons. Knowing the antecedent permits better prediction of the subsequent for first grade over sixth grade and eleventh grade over sixth grade.

By contrast, there were only two instances where significant differences were not thrown up in the persistence comparisons. The exceptions were: first grade versus eleventh grade and male sixth grade teachers versus female sixth grade teachers.

Comment. If a flow chart based on probabilities is constructed again, some pattern is discernable among the locations occupied by emitters.

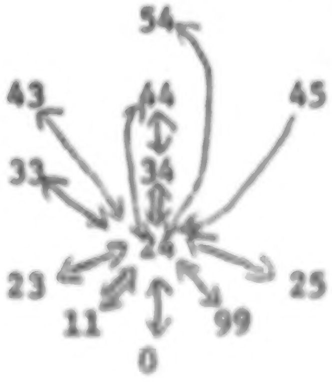

Figure 8-32. -- *Emitter location sequence tendencies*.

The pattern implies a relatively quick fire back and forth interchange between location 24 and others in the "action zone." Literally the only exchange-pair not involving location 24 is the pairing, 34 44. It is noticeable that each pair of locations constitutes a completed and independent loop.

Figure 8-33. -- Sequential Analysis: Target Location (Central) For All Classrooms

		Subsequent									
	T.L.	11	12	13	14	15	16	21	22	23	24
Antecedent	11	14*								2	14
	12		*								
	13			*							2
	14			(1)	*						1
	15					*					
	16						*				
	21							1*			
	22								1*	2	2
	23								(1)	26*	11
	24	(20)		(1)		(1)			(1)	7	1217*
	25	2									11
	26	1									1
	31									1	1
	32								(1)	1	2
	33		(1)	(1)						3	11
	34	4			(1)					1	46
	35										17
	36										2
	41										
	42										3
	43				(1)						6
	44	3			(1)			1		1	32
	45	2									9
	46										2
	51										
	52										
	53										4
	54	3									23
	55										4
	56										
	61										
	62										
	63										
	64										
	65										
	66										
	99									1	20
	0	17	(1)		(1)	(1)		(2)	(1)	(31)	(1069)
	TOT	66	2	3	4	3		4	3	76	2510

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Figure 8-33. (Continued)

T.L.	25	26	31	32	33	34	35	36	41	42
11	2				1	2				
12					1					1
13							1			
14										
15										
16										
21										
22										
23	1			3	1					
24	(20)	1	(1)	4	14	44	15	3		1
25	56*	2			2	3	6	7		
26	3	10*						2		
31			*							
32				13*		1	1			3
33				1	50*	11	2			
34	3			1	10	261*	7			1
35	2			1	3	4	80*	2		
36	3	(4)			1	1		23*		
41									*	
42				2		1				32*
43	3				2	3	1			
44	1				4	27	5	1		1
45	2					3	1			
46						3		2		
51										
52										3
53					4	3				
54	1			2	5	15	1	1		
55					1	6				
56						1				
61										
62										
63										
64										
65								1		
66										
99	1				2	3	2	2		
0	(58)	3	(1)	(17)	(55)	(190)	(43)	(31)	(1)	(8
TOT	156	20	2	44	156	582	165	75	1	50

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Figure 8-33. (Continued)

Antecedent T.L.	Subsequent 43	44	45	46	51	52	53	54	55	56
11		4	2					4	1	
12										
13										
14	1	1								
15										
16										
21										
22										
23										
24	7	35	8	5		1	2	26	3	
25	3	2		1				1		
26										
31										
32								4		
33	5	4	2	1			2	4	2	
34	6	23	3				2	13	5	1
35		5	2				1		1	
36		1		4				2		
41										
42	1	1				1				
43	113*	6	2				4	2	3	
44	4	153*	3				2	7	3	
45	1	6	41*				1	2		
46		3		29*				3		1
51					*					
52						10*				
53	2	2					12*	1	2	1
54	6	12	2	2		1	5	97*	2	
55	1	4	1	1			2	5	35*	3
56				4			1		2	4*
61										
62										
63								1		
64				1				1		
65		1		1						1
66										
99	1	10	1					3		
0	(78)	(141)	(67)	(22)		(6)	(10)	(89)	(30)	(7)
TOT	229	414	134	71		19	44	265	89	18

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Figure 8-33. (Continued)

Antecedent

T.L.	61	62	63	64	65	66	99	0	TOT
11					1		2	18	67
12									2
13									3
14									4
15								2	3
16									
21								3	4
22									5
23								33	76
24							15	(1062)	2514
25								60	156
26								1	20
31									2
32								18	44
33							2	33	155
34							5	131	384
35							2	63	163
36								33	76
41								1	1
42							1	9	50
43							3	80	229
44							6	161	416
45							1	63	134
46					1			22	71
51									
52								6	19
53			(1)	1				11	44
54				3	1		3	73	266
55								26	89
56					1			2	18
61	*								
62		*						1	1
63			*						1
64				7*	1			5	13
65					11*			8	19
66						*			
99							41*	49	136
0		(1)		(4)	(3)		(53)	4500*	6541
TOT		1	1	13	19		136	6549	11956

Figure 8-34. -- Persistence, Predictability and Reciprocity For Target Location (Central)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
All Classrooms	.342	.354	115.955	-22.25
1st Grade	[illegible]	.402	72.211	-25.47
6th Grade	.430	.174	89.448	-24.11
11th Grade	.296	.472	53.802	-27.11
Mathematics	.346	.351	96.467	-23.59
Social Studies	.337	.360	78.801	-24.93
Younger Teachers	.390	.268	84.325	-24.50
Older Teachers	.292	.441	100.390	-23.31
Female Teachers	.344	.363	101.246	-23.25
Male Teachers	.340	.345	92.795	-23.86
Male 6th Gr. Teachers	.424	.137	63.368	-26.23
Female 6th Gr. Teachers	.467	.160	58.940	-26.62
Male 11th Gr. Teachers	.279	.433	55.060	-26.99
Female 11th Gr. Teachers	.342	.624	13.719	-32.24
				degrees of freedom=703.

Target Location (Central Group)

Persistence. In comparison with the other variable classes, the K scores in Figure 8-34 are relatively low. This implies that there is relatively little change taking place that is external to shifts that occur in target locations. Undoubtedly the concentration of frequencies in cell 24 X 24 (where the ratio of incidents to episode is 1:1) contributes to this characteristic. There is, however, a slight tendency for more external changes to occur when the target is located further away from the front of the room.

Predictability. Knowing the antecedent target location permits the elimination of 35% of the error in predicting the subsequent target location.

Certain locations tend to attract more target emissions than do others. These are the same "center band" locations utilized by emitters, although #11 (diffuse-diffuse) does not feature as prominently.

Interestingly enough, no matter where the target is, it is likely that there will be no target in the next incident.

If the #0 category is ignored then the pattern of sequence is not dissimilar from the emitter pattern. Thus, a diffuse target is likely to precede a target located at #24. One at #24 is likely to precede one at #34 and one at #34 to precede one at #24. Variables #44 and #54 also lead toward incidents at #24.

Reciprocity. All the z transformations for all sub-sets of the sample were negative and high; there is a tendency for any category of a pair to be a subsequent as often as it is an antecedent.

Figure 8-35. -- Independent Variable Subset Comparisons For Target Location (Central)

Independent Variables	Predictability (Lambda)	Persistence (K)
1st vs. 6th	7.96*	-11.37*
6th vs. 11th	-11.09*	9.46*
1st vs. 11th	- 2.39*	- 2.47
Math vs. S.S.	- 0.41	0.62
-20 vs. +40	- 7.68*	7.03*
F vs. M	0.80	0.33
M 6th vs. 11th	- 6.86*	6.93*
F 6th vs. 11th	-10.39*	4.28*
6th M vs. F	0.45	- 1.90
11th M vs. F	- 4.80*	- 2.26

N.B. Sign signifies direction of difference:
positive indicates that the preceding sub-set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Sub-set comparisons. Figure 8-35 indicates whether the differences between the sample sub-set pairs are significant and also shows the direction of the variation. It is possible to predict the subsequent target location better for: first grade than sixth grade; eleventh grade than sixth grade; eleventh grade than first grade; older teachers than younger teachers; male eleventh grade teachers than male sixth grade teachers; female eleventh grade teachers than female sixth grade teachers; and male eleventh grade teachers than male sixth grade teachers.

There is evidence of significantly more persistence in the cases of: sixth grade versus first or eleventh grade; younger teachers versus older teachers; male eleventh grade teachers versus male sixth grade teachers; and female sixth grade teachers versus female eleventh grade teachers.

Comment. The tendency for all target locations to be succeeded in the next incident by no target locations gives target locations or quite unique characteristics. With but few exceptions, each location tends simply to reciprocate with #0, no target location. The only exception indicated in Figure 8-36 below is a reciprocation between locations #24 and #34, which is also balanced.

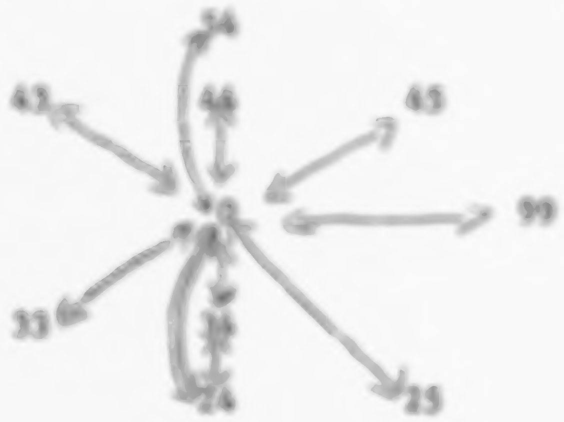


Figure 8-36. -- _Target location sequence tendencies._

Figure 8-37. -- Persistence, Predictability and Reciprocity For Audience Location (Vertical)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
All classrooms	.770	.859	4,710	-34,41
1st Grade	.814	.917	2,631	-33,19
6th Grade	.826	.772	1,411	-33,80
11th Grade	.761	.898	2,761	-33,13
Mathematics	.792	.829	2,767	-33,13
Social Studies	.676	.892	2,931	-33,06
Younger Teachers	.803	.788	4,247	-34,37
Older Teachers	.667	.960	1,388	-33,82
Female Teachers	.782	.911	2,120	-33,42
Male Teachers	.743	.801	3,626	-34,79
Male 6th Gr. Teachers	.713	.674	1,410	-33,80
Female 6th Gr. Teachers	.899	.137	0,011	-37,33
Male 11 Gr. Teachers	.764	.926	2,551	-33,22
Female 11th Gr. Teachers	.751	.818	.216	-36,82
				degrees of freedom=703.

Audience Location (Control Group)

The gross nature of the audience location data precludes any intensive analysis. The vast majority of audiences were identified as #11 (diffuse-diffuse). Thus in the audience location matrix (not presented) there were 9,324 frequencies in the 11 x 11 cell, 12 in the 24 x 11 cell, 83 in the 24 x 24 cell, 363 in the 0 x 11 cell, 258 in the 11 x 0 cell, and 1530 in the 0 x 0 cell, and virtually nothing anywhere else.

Understandably the Lambdas (Figure 8-37) are all very high (75% to 96%), the z transformations are all strongly negative and significant, and the K scores are also high. The K score for the whole sample was obviously strongly influenced by the 11 x 11 cell where the ratio of repeated episodes to incidence was an impressive 32:1.

Figure 8-38 presents comparisons for persistence and predictability for sub-sets of classrooms with regard to audience location. Persistence scores show the following results: sixth grade over both first and eleventh grade and eleventh grade over first grade, mathematics classes over social studies classes, younger teachers' classes over older teachers' classes, female sixth grade classes over female eleventh grade classes, and female over male teachers' classes at the sixth grade level. Predictability comparisons generated the following significant results: both first and eleventh grade over sixth grade, older teachers' over younger teachers' classes, female teachers' classes over male teachers' classes, and female teachers' classes over male teachers' classes at the sixth grade level.

Figure 6-31. -- Independent Variable Subset Comparisons for Indiana Location (Concl.)

Independent Variables	Predictability (Lambda)	Persistence (R)
1st vs. 6th	3.23*	-3.32*
6th vs. 11th	-2.60*	4.27*
1st vs. 11th	0.52	-3.30*
Sixth vs. S.S.	-1.30	3.19*
-30 vs. +40	-3.40*	6.22*
F vs. M	3.02*	2.32
M 6th vs. 11th	-4.12*	-1.08
F 6th vs. 11th	1.82	4.66*
6th M vs. F	-4.33*	-7.77*
11th M vs. F	1.43	.40

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Non-involved Actor Locations

In comparison with the other variables there are relatively few non-involved actor incidents. Altogether 782 were recorded, and 366 of these were diffusely located and followed episodes in which there was no non-involved actor. There were another 332 incidents where diffusely located non-involved actors were followed by incidents that had no non-involved actors. These two dominant features of the non-involved actor location data obviously account for the high Lambdas in Figure 8-39. Similarly the many vacant cells in the matrix (not presented) "explain" the strongly negative z transformations. The K scores are, of course, strongly influenced by a heavy loading in cell 11 x 11 where the ratio of incidents to episodes was 1:9.

In Figure 8-40 we find that these tendencies for predictability were stronger for eleventh grade over both first and sixth grades, mathematics over social studies classes, male teachers' over female teachers' classes, female eleventh over female sixth grade teachers' classes, and male over female teachers' classes at the sixth grade level. Persistence scores generated the following significant comparisons: sixth grade over both first and eleventh grades, older teachers' over younger teachers' classes, male over female teachers' classes (presumably and artifact), and male sixth over both male eleventh and female sixth grade classes.

The data are "instructive" in that they portray non-involvement as a relatively isolated, disconnected phenomenon. However, it is apparent that in these classrooms, at any rate, the phenomenon is fairly quickly extinguished. To this extent we see here no evidence for a non-involvement "contagion."

Figure 8-39. -- Persistence, Predictability and Reciprocity For [illegible]

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
All classrooms	.845	.815	29.650	-23.78
1st Grade	.785	.757	25.680	-30.32
6th Grade	.883	.903	5.417	-34.19
11th Grade	.738	.932	3.640	-34.12
Mathematics	.841	.870	25.890	-30.29
Social Studies	.843	.737	12.626	-32.46
Younger Teachers	.811	.824	12.379	-32.31
Older Teachers	.867	.816	21.919	-30.96
Female Teachers	.803	.760	28.362	-28.22
Male Teachers	.893	.968	3.250	-34.21
Male 6th Gr. Teachers	.908	.972	2.127	-23.43
Female 6th Gr. Teachers	.834	.728	3.362	-34.00
Male 11th Gr. Teachers	.755	.966	3.253	-34.93
Female 11th Gr. Teachers	.761	.921	2.304	-35.29

Figure 8-40. -- Independent Variable Subset Comparisons for Non-involved Actor Location

	Independent Variables	Predictability (Lambda)	Persistence (X)
Antecedent	1st vs. 6th	-0.40	-7.03*
	6th vs. 11th	-3.43*	7.42*
	1st vs. 11th	-4.98*	1.42
	Math vs. S.S.	2.75*	-0.15
	-30 vs. +40	0.19	-4.99*
	F vs. M	-4.62*	-8.60*
	M 6th vs. 11th	0.19	7.36*
	F 6th vs. 11th	-2.76*	2.45
	6th M vs. F	4.06*	4.33*
	11th M vs. F	0.92	-0.13

N.B. Sign signifies direction of difference:
positive indicates that the proceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

The next five sections deal with sequential data in primary peripheral groups. Necessarily, smaller frequencies will be involved. It should be kept in mind that most peripheral groups are transitory and that while reference will be made to the peripheral group, in fact, many different peripheral groups contributed the data.

Where the data have been too limited, textual discussion of the tables has been omitted.

Function (Peripheral Group)

Persistence. The K scores reflect only a moderate amount of persistence. The inference to be drawn is that some external changes occur during individual functional incidents but not an excessive number.

Predictability. Knowing the antecedent function in the peripheral group permits the elimination of 76% of the error in predicting the next function. The high Lambdas in Figure 8-42 are in part a consequence of the heavy loadings in cells 99 x 0 and 0 x 99, and the general tendency for most functions to be followed by no function. In fact, there is only one combination of any magnitude that does have #0 as the subsequent -- #31 (intellectualization about relevant subject matter) tends to be followed by #21 (information dissemination about relevant subject matter), and vice versa.

Reciprocity. The z transformations in Figure 8-42 imply that both halves of the table are symmetrical and that any function tends to be an antecedent as often as it is a subsequent.

Sub-set comparisons. The six significant K comparisons show that if the antecedent is known, it is possible to predict significantly better to the subsequent in the case of:

Figure D-41. -- Sequential Analysis: Function in the Primary Peripheral Group For All Classrooms

		Subsequent														
	Fn.	11	12	13	14	21	22	23	24	31	32	33	34	99	0	TOT
Antecedent	11	1*												1	1	3
	12		1*												1	2
	13			*										1	3	4
	14				*											
	21					190*	4	1	13	(25)	(1)			3	31	270
	22	(1)				2	106*	(3)	6	2	(1)			14	22	137
	23						4	11*	1	1				2	2	21
	24					12	11	2	68*	7				6	41	147
	31					26	1		6	198*				1	11	243
	32					1	1				10*					12
	33											*				
	34												*	1		1
	99					6	8	2	5					1630*	(806)	2337
	0	(1)	(1)	(4)		(32)	(20)	2	(41)	12			(1)	866	7770*	8760
	TOT	3	2	4		269	155	21	144	243	12		1	2329	8774	11337

Figure 8-42. -- Persistence, Predictability and Reciprocity For Function (Peripheral)

	Independent Variables	Persistence (K)	Predictability (Lambda)	(Chi Sq.)	Reciprocity (Z Transformation)
Antecedent	All classrooms	.572	.758	12,281	- 8.50
	1st Grade	.503	.761	14,543	- 8.06
	6th Grade	.600	.758	6,129	- 9.95
	11th Grade	.547	.819	7,366	- 9.61
	Mathematics	.606	.674	9,474	- 9.10
	Social Studies	.519	.872	11,195	- 8.72
	Younger Teachers	.613	.709	11,813	- 8.59
	Older Teachers	.503	.839	3,559	-10.79
	Female Teachers	.600	.709	13,284	- 8.30
	Male Teachers	.532	.851	7,348	- 9.62
	Male 6th Gr. Teachers	.505	.923	2,427	-11.25
	Female 6th Gr. Teachers	.645	.661	5,554	-10.12
	Male 11th Gr. Teachers	.530	.802	8,072	- 9.44
	Female 11th Gr. Teachers	.614	.919	0,035	-13.19
					degrees of freedom=91.

Figure 8-43. -- Independent Variable Subset Comparisons Function (Peripheral)

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	0.08	-4.29*
	6th vs. 11th	-2.08	2.68*
	1st vs. 11th	-1.71	-1.81
	Math vs. S.S.	-7.82*	5.07*
	-30 vs. +40	-5.06*	6.25*
	F vs. M	-5.60*	3.99*
	M 6th vs. 11th	3.99*	-0.94
	F 6th vs. 11th	-5.55*	0.86
	6th M vs. F	7.37*	-5.47*
	11th M vs. F	-2.74*	-2.27

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Social studies teachers versus mathematics teachers

Older teachers versus younger teachers

Male teachers versus female teachers (possibly artifactive, see below)

11th grade female teachers versus 6th grade female teachers

6th grade male teachers versus 6th grade female teachers

11th grade female teachers versus 11th grade male teachers

Similarily, great persistence is to be found in:

6th grade teachers versus 1st grade teachers

6th grade teachers versus 11th grade teachers

Math teachers versus social studies teachers

Younger teachers versus older teachers

Female teachers versus male teachers

Sixth grade female teachers versus sixth grade male teachers

Comment. The frequency with which no function was the antecedent of any function is the most notable character of the peripheral function sequential analysis.

Role Allocation (Peripheral)

Persistence. The K scores in Figure 8-46 imply moderate persistence only. An inspection of the ratios of incidents to episodes in the variables, where there are frequencies of any magnitude, reveals that there is about as much internal change as external change. (Recall that, as a general rule, peripheral incidents are short-lived).

Predictability. Knowing the antecedent role allocation permits the elimination of 60% of the error in predicting the subsequent role allocation. In the case of male sixth grade and female eleventh grade teachers, the percentage of error eliminated rises to 86% (Figure 8 8-46).

Figure 8-44. -- Sequential Analysis: Role Allocation (Peripheral) For All Classrooms

Antecedent

	Subsequent									
R.A.	101	103	104	107	113	114	120	122	123	124
101	*									
103		66*							26	
104			1*						1	1
107				*						
113					1*					
114						*				
120		3					51*	1	2	
122								1*	1	
123		23					2		152*	
124										*
130										
133		2							1	
134										
140										
143										
203										
204										
207										
210							2		3	
212			(1)				1			
213		(31)	(1)						25	
214		1								
217										
220							3		4	
224										
226										
227										
241										
253										
254										
304										
306		2							2	
307		6								
313		11	(1)						14	
314										
324										
326									1	
327										
353										
410										
413										
504										
603										
604										
700										
703										
0		11			(1)		(32)	(2)	(50)	(4)
TOT		156	4		2		91	4	282	5

(Continued on next page)

Figure 8-44. (Continued)

Antecedent	Subsequent									
R.A.	130	133	134	140	143	203	204	207	210	212
101										
103		(2)							2	1
104										
107										
113										
114										
120									1	
122										
123		1							4	
124										
130	*									
133		4*								
134			*							
140				*						
143					*					
203						1*				
204							2*			
207								*		
210	(1)					1			24*	2
212									2	6*
213									4	(5)
214										
217										
220						1			5	2
224										
226										
227										
241										
253									1	
254										
304										
306										
307										
313									1	
314										
324										
326										
327										
353										
410										
413										
504										
603										
604										
700										
703										
0	(1)	(2)				(3)	(2)		(34)	1
TOT	2	9				6	4		78	17

Figure 8-44. (Continued)

	Subsequent									
R.A.	**213**	**214**	**217**	**220**	**224**	**226**	**227**	**241**	**253**	**254**
Antecedent										
101										
103	29	1								
104	1									
107										
113										
114										
120	1			2						
122										
123	(36)			6						
124	1									
130				1						
133	1									
134										
140										
143										
203				1						
204				1						
207										
210	7			6						
212	4									
213	102*			3					(1)	
214		2*								
217			0 *							
220	4			887*						
224					1*					
226						0*				
227							0*			
241								0*		
253									0*	
254										0*
304										
306	1									
307										
313	12									
314										
324										
326										
327										
353										
410										
413										
504										
603										
604										
700										
703										
0	18	(3)		(669)	(2)					
TOT	217	6		1576	3				1	

Figure 8-44. (Continued)

Antecedent	Subsequent								
R.A.	304	306	307	313	314	324	326	327	353
101									
103		1	(4)	15					
104									
107									
113									
114									
120									
122									
123		2	2	4			(1)		
124									
130									
133									
134									
140									
143									
203									
204									
207									
210									
212									
213		1		(22)					
214									
217									
220									
224									
226									
227									
241									
253									
254									
304	0*								
306		0*							
307			2*						
313				3*					
314					0*				
324						0*			
326							0*		
327								0*	
353									0*
410									
413									
504									
603									
604									
700									
703									
0		(3)		1					
TOT		7	8	45			1		

Figure 8-44. (Continued)

		Subsequent								
	R.A.	410	413	504	603	604	700	703	0	TOT
Antecedent	101									
	103								9	156
	104									4
	107									
	113								1	2
	114									
	120								32	93
	122								2	4
	123								49	282
	124								4	5
	130								1	2
	133								1	9
	134									
	140									
	143									
	203								3	5
	204								1	4
	207									
	210								34	80
	212								2	16
	213								23	218
	214								3	6
	217									
	220								(655)	1561
	224								2	3
	226									
	227									
	241									
	253									1
	254									
	304									
	306								2	7
	307									8
	313								2	44
	314									
	324									
	326									1
	327									
	353									
	410	0*								
	413		0*							
	504			0*						
	603				0*					
	604					0*				
	700						0*			
	703							0*		
	0								7774	8613
	TOT								8600	11956

Figure 8-45. -- Persistence, Predictability and Reciprocity For Role Allocation (Peripheral Group$_1$)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation
All classrooms	.527	.592	43.820	-37.12
1st Grade	.678	.609	18.804	-40.35
6th Grade	.524	.563	35.260	-38.09
11th Grade	.497	.721	27.490	-39.07
Mathematics	.533	.508	36.492	-37.94
Social Studies	.481	.790	18.334	-40.43
Younger Teachers	.536	.540	48.155	-36.67
Older Teachers	.470	.757	16.166	-40.80
Female Teachers	.525	.515	46.768	-36.81
Male Teachers	.500	.756	26.615	-39.19
Male 6th Gr. Teachers	.408	.859	5.304	-43.23
Female 6th Gr. Teachers	.514	.477	34.362	-38.20
Male 11th Gr. Teachers	.481	.698	27.455	-39.08
Female 11th Gr. Teachers	.561	.857	3.533	-43.83
				degrees of freedom=1,081

Figure 8-46. -- Independent Variable Subset Comparisons For Role Allocation (Peripheral Group$_1$)

Independent Variables	Predictability (Lambda)	Persistence (K)
1st vs. 6th	1.14*	-1.68
6th vs. 11th	-4.57*	1.04
1st vs. 11th	-2.63*	-0.66
Math vs. S.S.	-9.66*	2.53
-30 vs. +40	-7.24*	3.17*
F vs. M	-8.02*	1.24
M 6th vs. 11th	4.01*	0.53
F 6th vs. 11th	-6.83*	-1.08
6th M vs. F	9.97*	-0.56
11th M vs. F	-2.79*	-1.77

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

In Figure 8-45 it is clear that the high predictability is partly accounted for by the tendency for many allocations to be followed by no allocations. There are, however, distinctive functions to be found among other individual variables. Eight variables accommodate most of the cases. They are:

#103 (teacher emitter, no target, segment audience);
#120 (teacher emitter, single pupil target, no audience);
#123 (teacher emitter, single pupil target, segment audience);
#210 (single pupil emitter, teacher target, no audience);
#213 (single pupil emitter, teacher target, segment audience);
#220 (single pupil emitter, single pupil target, no audience);
#313 (segment emitter, teacher target, segment audience);
#0 (no allocation).

Thus, #103 tends to be followed by #213 or #123; #123 by #103 or #213; #213 by #103, #123 or #313; and #0 by #120, #123, #210, #220, and vice versa.

Reciprocity. The high, negative transformation in Figure 8-45 implies that there is considerable symmetry between the two halves of the table. Again this is partly a function of the considerable number of vacant cells in the matrix.

Sub-set comparisons. All the Lambda comparisons (Figure 8-46) except one (first grade versus sixth grade) yielded significant results. Only two persistence scores, however, showed significant differences between the sub-sets. They favored: younger teachers over older teachers and male sixth grade teachers over male eleventh grade teachers.

Comment. Given the transitory nature of peripheral groups, it is of interest to examine the pattern of their coming and going. By linking the two step frequencies on the basis of the probability of the next antecedent, patterns may again be discerned among the data. In Figure 8-47 the patterns have been illustrated.

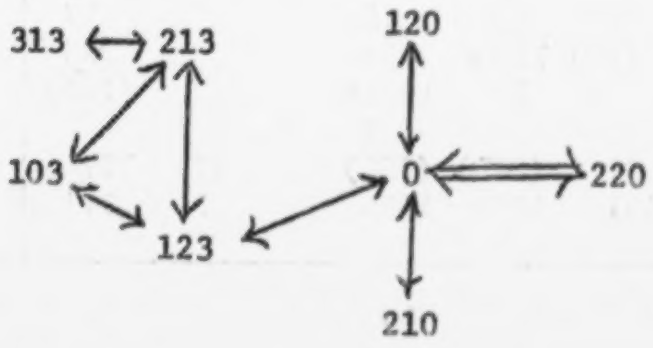


Figure 8-47.-- Peripheral role allocation sequence tendencies.

Three patterns can be observed in Figure 8-47. Peripheral groups that do not have an audience (Nos. #120,#210,#220) follow from and decoy into a state of no peripherality. Groups having a segmental audience, however (Nos. #103,#123,#213), are likely to be transformed into other types of peripheral groups, again with the segment audience. Of these latter, groups with a single pupil emitter tend to become groups with a segment emitter.

Role Structure (Peripheral Group)

There are four structures that accommodate most of the frequencies recorded in Figure 8-48. They are: #2 (emitter + audience); #3 (emitter + target + audience); #4 (emitter + target); and #0 (no antecedent role structure).

Persistence. The K scores in Figure 8-49, which again fall in the middle range, imply that not a great deal of change occurs while the role structures remain constant. The ratios of incidents to episode change are approximately 5:4, 1:2, 4:5, 5:4.

Figure 8-48. -- Sequential Analysis: Role Structure (Peripheral Group$_1$) For All Classrooms

		Subsequent						
	R.S.	1	2	3	4	5	0	TOT
Antecedent	1	3*		1			1	5
	2		88*	81	5		17	191
	3		(76)	726 *	66		233	1101
	4		6	79	1073*		(746)	904
	5				2	*		2
	0	(2)	21	(208)	(750)	(2)	7774 *	8757
	TOT	5	191	1095	1896	2	8771	11956

Predictability. The Lambda in Figure 8-49 indicates that knowing an antecedent Role Structure permits the elimination of 63% of the error in predicting the next role structure, after deletion of repeated episodes.

If the matrix itself is examined (Figure 8-48) it is apparent that there is a high probability that any role structure will be succeeded by a situation in which no roles exist. There is one exception to this -- an emitter + audience structure (#2) is more likely to reciprocate with an emitter + target + audience structure (#3).

Reciprocity. By comparison with the other z transformations, those resulting from the peripheral role structure data are particularly small. Nonetheless an inspection of the matrix reveals that there is no dramatic variation between corresponding antecedents and subsequents. For example, #3 precedes #4 in 66 occurrences and #4 precedes #3 in 79 occurrences. There are no grounds for claiming that any one variable is likely to be subsequent to any other more than it is antecedent to it.

Sub-set comparisons. Figure 8-50 shows that only in the case of eleventh grade in comparison with sixth grade was a significant difference in predictability found. However, there were five in the case of persistence. They favored: Mathematics classes over social studies classes; younger teachers over older teachers; female teachers over male teachers; female sixth grade teachers over male sixth grade teachers; and female eleventh grade teachers over male eleventh grade teachers.

Figure 8-49. -- Persistence, Predictability and Reciprocity
For Role Structure (Peripheral Group1)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	Reciprocity (Z Transformation
All classrooms	.553	.628	8.598	-1.24
1st Grade	.509	.665	0.956	-4.00*
6th Grade	.559	.580	8.021	-1.38
11th Grade	.535	.676	5.657	-2.02
Mathematics	.571	.615	5.794	-1.98
Social Studies	.522	.661	5.514	-2.06
Younger Teachers	.582	.623	4.688	-2.32
Older Teachers	.500	.651	5.039	-2.21
Female Teachers	.578	.622	1.874	-3.45
Male Teachers	.518	.647	9.281	-1.08
Male 6th Gr. Teachers	.505	.625	5.965	-1.93
Female 6th Gr. Teachers	.583	.628	2.877	-2.99
Male 11th Gr. Teachers	.512	.662	5.128	-2.18
Female 11th Gr. Teachers	.621	.769	3.391	-2.78
				degrees of freedom=15.

Figure 8-50. -- Independent Variable Subset Comparisons For Role Structure (Peripheral Group$_1$)

Independent Variables	Predictability (Lambda)	Persistence (K)
1st vs. 6th	2.24	-2.22
6th vs. 11th	-2.82*	1.25
1st vs. 11th	-0.27	-1.04
Math vs. S.S.	-1.56	2.85*
-30 vs. +40	-0.93	4.68*
F vs. M	-0.81	3.52*
M 6th vs. 11th	-0.81	-0.28
F 6th vs. 11th	-2.26	-1.07
6th M vs. F	-0.05	-3.07*
11th M vs. F	-1.71	-3.00*

N.B. Sign signifies direction of difference: positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set; negative indicates the opposite.

Comment. Given the transitory nature of peripheral groups, it is not altogether surprising to find that most role structures lead to a no role structure condition. Interestingly enough, role structure #2, emitter + audience, does not do so. The relevant pattern is displayed in Figure 8-51.

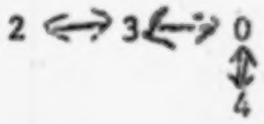


Figure 8-51. -- Peripheral role structure sequence tendencies.

Emitter Location (Peripheral Group).

Persistence. Once again the K comparisons of Figure 8-53 are middle of the range scores, and there appears to be as much change within the emitter location variable class as there is without.

Predictability. There is relatively little predictability evidenced in Figure 8-53. Knowing the antecedent emitter location permits the elimination of only 17% of the error in predicting the subsequent emitter location. However, once again the peripheral group emitters are likely to be located in the critical center band area, and although most locations tend to be followed by no emitter locations, the few nonconformist cases are concentrated in this zone.

Reciprocity. The z transformations of Figure 8-53 are all strongly negative. This finding is consistent with the general distribution of frequencies to be observed in Figure 8-52.

Sub-set comparisons. The comparisons favored male teachers over female teachers, and male sixth grade teachers over female sixth grade teachers for predictability; and they favored younger teachers over older ones for persistence.

Figure 8-52. -- Sequential Analysis: Emitter Location (Peripheral) For All Classrooms

Antecedent		Subsequent									
	E.L.	11	12	13	14	15	16	21	22	23	24
	11	30*									12
	12		*								
	13			*							
	14				*						
	15					*					
	16						*				
	21							*			
	22								*		
	23									1*	1
	24	7									92*
	25										6
	26										
	31										
	32										
	33	6								(1)	10
	34	(19)									10
	35										2
	36										
	41										
	42										
	43	8									
	44	1									4
	45										1
	46										
	51										
	52	1									
	53	7									3
	54	2									1
	55										
	56										
	61										
	62										
	63										
	64										
	65										
	66										
	99	3									3
	0	13								(1)	(47)
	TOT	97								3	192

(Continued on next page)

Figure 8-32 (Continued)

Antecedent	Subsequent									
E.L.	25	26	31	32	33	34	35	36	41	42
11	1				4	22				
12										
13										
14										
15										
16										
21										
22										
23										
24		(1)			8	17	2	1		
25	12*	(1)				2				
26	1	4*								
31			*							
32				4*						
33	1				92*	10				
34	2				19	520*	2			
35					2	3	58*			
36						1		1*		
41									*	
42					1					*
43					2	17				
44					3	9				
45										
46										
51										
52										
53					1	16	1			
54	1				1	5				
55						1				
56										
61										
62										
63										
64										
65										
66										
67										
99						2				
0	(7)		(1)	(3)	(66)	(230)	(35)	(4)		(1)
TOT	25	6	1	7	199	855	98	6		1

(Continued on next page)

Figure 8-52. (Continued)

	E.L.	43	44	45	46	51	52	53	54	55	56
Antecedent	11	4	2				1	7	1		
	12										
	13										
	14										
	15										
	16										
	21										
	22										
	23		1								
	24	4	4	2				4	1		
	25										
	26										
	31										
	32										
	33	2	1					3			
	34	15	11	1				15	1	3	1
	35		1	3				1	1	1	
	36	1									
	41										
	42										
	43	107*	2					3	2		
	44	2	308*	4					8	3	
	45	2	4	111*					1	3	1
	46			1	1*					1	
	51					*					
	52						2*				
	53	3						72*	3		
	54	1	4	1				3	208*		
	55		2	2					1	88*	
	56			1	1						*
	61										
	62										
	63										
	64			1					2		
	65										1
	66										
	99							1			
	0	(68)	(200)	(42)	(4)		(8)	(39)	(140)	(53)	(3)
	TOT	208	541	169	6		11	148	369	152	6

(Continued on next page)

Figure 8-52. (Continued)

Antecedent

	Subsequent								
E.L.	61	62	63	64	65	66	99	0	TOT
11								14	98
12									
13									
14									
15									
16									
21									
22									
23								1	4
24							2	49	194
25								6	27
26								2	7
31								1	1
32								3	7
33							2	70	198
34							2	(234)	855
35							1	25	98
36								3	6
41									
42									1
43								67	208
44								202	544
45							1	46	170
46								3	6
51									
52								8	11
53								42	148
54		(1)		4				137	369
55					1			57	152
56					1			3	6
61	*								
62		*						1	1
63			*						
64				18*				7	28
65				1	19*			8	29
66					1	*			1
99							1*	3	13
0				(5)	(6)	(1)	(4)	7780	8761
TOT		1		28	28	1	13	8772	11956*

Figure 8-53. -- Persistence, Predictability and Reciprocity For Emitter Location (Peripheral Group$_1$)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
All classrooms	.552	.169	77.909	-25.00
1st Grade	.514	.161	42.990	-28.21
6th Grade	.551	.170	51.054	-27.38
11th Grade	.547	.239	39.392	-28.61
Mathematics	.552	.175	63.058	-26.25
Social Studies	.548	.192	39.988	-28.54
Younger Teachers	.569	.149	62.702	-26.28
Older Teachers	.518	.222	41.343	-28.39
Female Teachers	.556	.123	57.752	-26.74
Male Teachers	.545	.261	41.911	-28.33
Male 6th Gr. Teachers	.549	.343	17.083	-31.64
Female 6th Gr. Teachers	.546	.122	40.306	-28.50
Male 11th Gr. Teachers	.530	.231	35.580	-29.05
Female 11th Gr. Teachers	.611	.301	13.665	-32.25
				degrees of freedom=703.

Figure 8-54. -- Independent Variable Subset Comparisons For Emitter Location (Peripheral Group)

Independent Variables	Predictability (Lambda)	Persistence (K)
1st vs. 6th	0.19	-1.72
6th vs. 11th	-1.71	0.24
1st vs. 11th	-1.56	-1.39
Math vs. S.S.	-0.48	0.25
-30 vs. +40	-2.07	3.01*
F vs. M	-3.93*	0.69
M 6th vs. 11th	2.01	0.74
F 6th vs. f	-2.20	-1.85
6th M vs. F	4.37*	0.10
11th M vs. F	-0.32	-2.26

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set;
negative indicates the opposite.

Figure 8-55. -- Sequential Analysis: Target Location (Peripheral) For All Classrooms

Antecedent TL	Subsequent 11	12	13	14	15	16	21	22	23	24	25	26	31.
11	62*												
12		0*											
13			0*										
14				0*									
15					0*								
16						0*							
21							0*						
22								0*					
23									1*	2			
24	1									104*	3		
25										3	6*		
26										1		10*	
31													0*
32													
33									3	6			
34										8	1		
35										1			
36										1			
41													
42													
43	1									4			
44	5									3			
45	2									1			
46										1			
51													
52													
53	1									3			
54	3									1	1		
55													
56													
61													
62													
63													
64													
65													
66	2												
99													
0	(14)								2	(62)	(6)	(2)	
TOT	91								6	201	17	12	

Figure 8-55. (Continued)

	Subsequent												
Antecedent TL	32	33	34	35	36	41	42	43	44	45	46	51	52
11								1	2	1			
12													
13													
14													
15													
16													
21													
22													
23		2	1										
24		3	10	1	1			2	1		1		
25			1							1			
26													
31													
32		1											
33		130*	9					1	1				
34	(1)	14	355*	3				6	11	3			
35		1	1	67*					2	1			
36					0*						1		
41						0*							
42							0*						
43		5	8					156*	2	2			
44		2	6					5	212*	5			
45			2						4	104*	1		
46										1	6*		
51												0*	
52													0*
53		2	10					4	2				
54			2	2				1	8				
55			1						3	2			
56										2			
61													
62													
63													
64			1										
65													
66													
99			3										
0	(1)	(93)	(216)	(39)	(2)		(1)	(97)	(161)	(52)	(2)		(1)
TOT	2	253	626	112	3		1	273	409	174	11		1

Figure 8-55. (Continued)

Antecedent	Subsequent												
TL	53	54	55	56	61	62	63	64	65	66	99	0	TOT
11	2	2	1					1		(1)		20	93
12													
13													
14													
15													
16													
21													
22													
23													
24	3	1	1									73	205
25												6	17
26												2	13
31													
32												1	2
33	1	1										102	254
34	12	2	1	1				1			2	(205)	626
35		2										38	113
36												1	3
41													
42												1	1
43	3	3									1	89	274
44	2	7	1					1				163	412
45		3	2									56	175
46				1								2	11
51													
52												1	1
53	81*	1	1									49	154
54		229*	2			(1)		1				167	418
55	1	1	103*									63	174
56				0*								3	5
61					0*								
62						0*						1	1
63							1*					1	2
64		1						11*				4	17
65									4*			2	6
66										0*			2
99											3*	8	14
0	(49)	(165)	(62)	(3)			(1)	(2)	(2)	(1)	(8)	7906	8950
TOT	154	418	174	5		1	2	17	6	2	14	8964	11956

Figure 8-56. -- Persistence, Predictability and Reciprocity For Target Location (Peripheral Group1)

Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
All classrooms	.534	.164	57.468	-26.76
1st Grade	.516	.188	42.382	-28.28
6th Grade	.529	.217	38.084	-28.76
11th Grade	.533	.154	27.605	-30.05
Mathematics	.527	.190	47.746	-27.71
Social Studies	.540	.135	41.633	-28.36
Younger Teachers	.543	.142	42.597	-28.25
Older Teachers	.516	.211	38.555	-28.70
Female Teachers	.527	.134	53.734	-27.12
Male Teachers	.542	.205	32.508	-29.42
Male 6th Gr. Teachers	.557	.329	17.169	-31.62
Female 6th Gr. Teachers	.502	.151	30.409	-29.68
Male 11th Gr. Teachers	.520	.139	21.110	-30.99
Female 11th Gr. Teachers	.580	.232	12.916	-32.40
				degrees of freedom=703.

Comment. Necessarily the extent to which locations are occupied by peripheral group emitters is contingent on the existence of emitters. Because of the permanence of peripheral groups and their correspondingly short-lived roles, most emitter locations tend to be succeeded by a condition in which no emitters are featured.

Target Location (Peripheral Group)

Persistence. In general, the K scores of Figure 8-56 indicate that changes in other structural or functional characteristics of the classroom occur with approximately the same speed as do changes in the location of target.

Predictability. The Lambdas in Figure 8-56 indicate that a relatively small proportion of the error (16%) may be eliminated in predicting the next target location from knowledge of the preceding one.

In Figure 8-55 the pattern of distribution of frequencies is similar to the distribution of emitter locations. With but few (and relatively insignificant) exceptions, most target locations are followed by incidents in which no targets exist. Such incidents, however, are most likely to be followed by targets located in locations #34, #44, and #24, in that order.

Reciprocity. The z transformations in Figure 8-56 are all negative. They imply, and inspection confirms, that any location paired with any other is as likely to maintain a subsequent relationship as often as it is likely to maintain an antecedent relationship.

Sub-set comparisons. No significant differences were found for any of the persistence comparisons. Predictability, however, was

Figure 8-57. -- Independent Variable Subset Comparisons For Target Location (Peripheral Group$_1$)

Independent Variables	Predictability (Lambda)	Persistence (X)
1st vs. 6th	- 0.63	-0.60
6th vs. 11th	1.50	-0.22
1st vs. 11th	0.69	-0.74
Math vs. S.S.	1.48	-0.75
-30 vs. +40	- 1.85	1.51
F vs. M	- 1.91	-0.93
M 6th vs. 11th	3.34*	1.44
F 6th vs. 11th	- 1.01	-2.12
6th M vs. F	3.18*	2.18
11th M vs. F	- 1.14	-1.61

N.B. Sign signifies direction of difference:
positive indicates that the preceeding sub-set of the pair scores higher than the succeeding sub set;
negative indicates the opposite.

higher for male sixth grade teachers over male eleventh grade teachers, and for male sixth grade teachers over female sixth grade teachers.

Comment. The sequential target locations data from peripheral groups can be summarized very briefly. Wherever a target is located it is likely that no other target will succeed it. When new targets are found they are likely to be somewhere in the center band.

Audience Location (Peripheral Group).

As was true for the matrices for central group audience location, peripheral group audiences do not generate much that is of sequential interest. Most of the frequencies in the matrix appear either along the major diagonal of the matrix -- that is, represent episodes -- or in sequence with code 0 (no peripheral audience). As a result, the matrix for all classrooms taken together is not reproduced here.

Persistence. Figure 8-58, however, reports values for persistence scores which indicate that when peripheral audiences do exist they tend to persist while other structural and functional changes are taking place. The K value for all classrooms taken together is .715, a score considerably higher than comparable K values for either emitter or target locations.

Predictability. The Lambdas in Figure 8-58 incidate that in comparison with target location, a somewhat larger proportion of the error (48%) may be eliminated in predicting the next audience location from knowledge of the preceding one, once the major diagonal has been deleted from the matrix. Audience location is most predictable

Figure 8-53. -- Persistence, Predictability and Reciprocity
For Audience Location (Peripheral)

	Independent Variables	Persistence (K)	Predictability (Lambda)	Reciprocity (Chi Sq.)	(Z Transformation)
Antecedent	All classrooms	.715	.482	20.046	-31.15
	1st Grade	.547	.679	4.942	-34.34
	6th Grade	.784	.457	10.162	.32.97
	4th Grade	.599	.390	12.911	.32.40
	Mathematics	.787	.532	14.820	.32.04
	Social Studies	.560	.441	14.511	-32.10
	Younger Teachers	.780	.425	16.438	-31.75
	Older Teachers	.564	.551	7.949	-33.59
	Female Teachers	.780	.555	10.051	-33.00
	Male Teachers	.572	.417	14.165	-32.16
	Male 6th Gr. Teachers	.585	.452	2.203	-35.38
	Female 6th Gr. Teachers	.840	.462	8,434	-33.38
	Male 11th Gr. Teachers	[illegible]	.392	12.310	-32.52
	Female 11th Gr. Teachers		.375	1.429	-35.79
					degrees of freedom=703.

Figure 8-59. -- Independent Variable Subset Comparisons For Audience Location (Peripheral Group_1)

	Independent Variables	Predictability (Lambda)	Persistence (K)
Antecedent	1st vs. 6th	2.92*	-6.52*
	6th vs. 11th	0.87	6.42*
	11th vs. 1st	3.53*	-1.19
	Math vs. S.S.	1.41	8.91*
	-30 vs. +40	-1.94	8.35*
	F vs. M	2.13	8.17*
	M 6th vs. 11th	0.62	0.60
	F 6th vs. 11th	0.49	2.12
	6th M vs. F	-0.10	-7.20*
	11th M vs. F	0.10	-3.34*

N.B. Sign signifies direction of difference: positive indicates that the preceeding sub-set of the pair scored higher than the succeeding sub set; negative indicates the opposite.

in first grade (Lambda = .679) and least at the eleventh grade level (Lambda = .390).

Reciprocity. The z transformations in Figure 8-58 are all greatly negative indicating a great deal of symmetry in the audience locations for each grouping of classrooms.

Sub-set comparisons. Figure 8-59 reports sub-set comparisons for audience location. Among persistence comparisons, seven generated significance: sixth grade over both first and eleventh grades, mathematics over social studies, younger teachers' over older teachers' classes and female teachers' over male teachers' classes both overall and again at the sixth and eleventh grade levels. Only two comparisons generated predictability significances: first grade over both sixth and eleventh grades.

Comment. Again, the sequential audience location data may be summarized briefly. Whenever an audience exists it tends to remain in one location until it ceases to exist, and (not unexpectedly) the commonest location for audiences is diffuse-diffuse (code 11).

Summary

Time, as a dimension to be accommodated in the study of human behavior, is both a necessary condition and an embarrassment. It is much more convenient to ignore it than to acknowledge it. Most researchers tend to suspend time. A sample of the phenomenon is taken at a given point in time and conclusions are made that either fail to recognize the time factor ro else make some rather tenuous assumptions about antecedent or subsequent conditions. Alternatively, researchers take samples of time -- slices here, slices there -- that together constitute a kind of time lapse record. Inferences are then made about the nature of continuity.

The devices by which time is identified in every day life are both phenomenological and analytic. A day has an objective realty that contrasts strongly with the analytic artificiality of a second (even though it was logically derived from the larger phenomenological unit). Both, however, serve the same purpose. They provide categorical systems which make it convenient to handle the abstract time concept. But they both do violence to the time concept in that they convert time -- a fluid thing -- to a series of sequential instances. Whether this tendency is the result of the natural human condition or not is perhaps a subject more suitable to psychology or philosophy. However, it does point up the fact that time may be treated operationally in different ways.

In the present study an attempt has been made to capture time by analyzing intra-variable sequences of length one of time-adjacent episodes defined in terms of the dependent variables used for classroom activity analysis. It should be clear by now that a variety of findings were obtained. We shall provide three types of summaries here: individual summaries of the more interesting sequential patterns, summaries of comparisons among the dependent variables, and summaries of independent variable comparisons.

Sequential Patterns.

Although the analyses carried out here were of length one sequences, it is possible to construct graphs of length greater than one that "picture" the major sequential tendencies within a matrix -- provided one is willing to make the assumption that probabilities within such an extended sequential structure are relatively independent of one another. Graphs of such a form provide a reasonably efficient way of summarizing some of the more interesting findings.

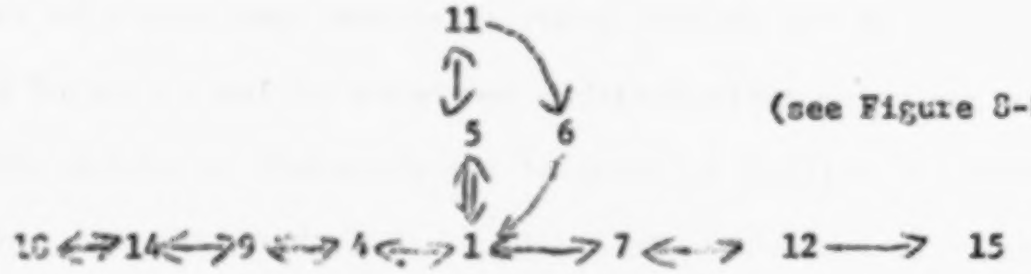
Proposition 8-1. Typical communication structure sequences include (as illustrated below):

(a) Reciprocation between three branches and the structure of central group only (1).

(b) The most likely branch containing the central group plus one or more peripheral groups (5, 11, 6), in which case the route back to the central group structure is through elimination of the peripheral groups one-by-one.

(c) The next most likely branch containing the central group plus non-involved persons and peripheral groups (7, 12, 15), in which case the non-involved persons appear first and are last to disappear.

(d) The last branch containing structures without a central group (4, 9, 14, 10), in which case non-involved persons appear first and again are last to disappear.



(see Figure 8-8)

As noted earlier in the text, the separation of the three branches within the above figure are remarkably clean and suggest that classroom activities form three genotypes with respect to communication structure.

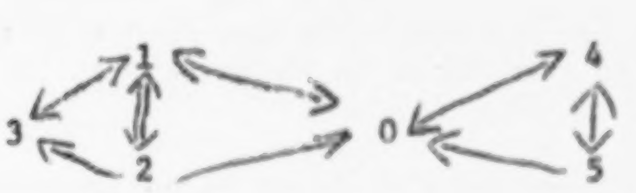
Proposition 8-2. Typical teacher role assignment sequences include (as illustrated below):

(a) A structure of two branches representing teacher membership on central or peripheral groups, connected by incidents in which the teacher has no role (code 0).

(b) When the teacher is in the central group, he reciprocates rapidly between emitter role (1) and target role (2) and less often enteres the audience role (3) from either.

(c) He is, however, less likely to pass from audience membership to being a target, and less likely to begin membership within the group as anything other than an emitter.

(d) When teacher is in a peripheral group (4, 5) the same findings obtain, except that he is not likely to enter an audiential role at all.



(see Figure 8-24)

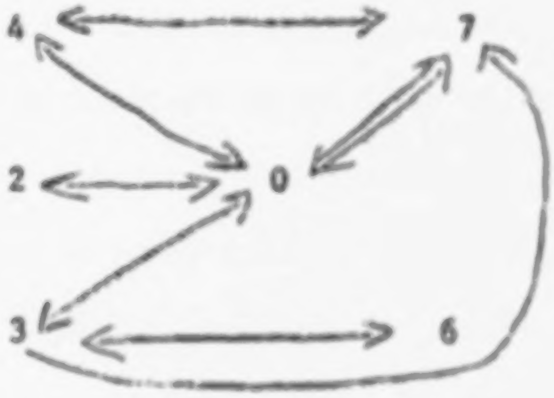
Proposition 8-3. Typical non-involved role allocation sequences include (as illustrated below):

(a) At the center of events are incidents in which there were no non-involved persons (code 0).

(b) With this condition, non-involved pupils (code 2), pupil segments (3), and pupil quorums (4) are likely to reciprocate.

(c) Non-involvement of a pupil segment is also likely to bring in the teacher (3→6) and vice versa; non-involvement of a pupil quorum is likely to bring in the teacher (4→7) and vice versa.

(d) All persons in the classroom are also likely to be non-involved and to reciprocate with lack of non-involvement (0→7→0).



(see Figure 8-20)

Proposition 8-4. Typical central group role allocation sequences include (as illustraded below):

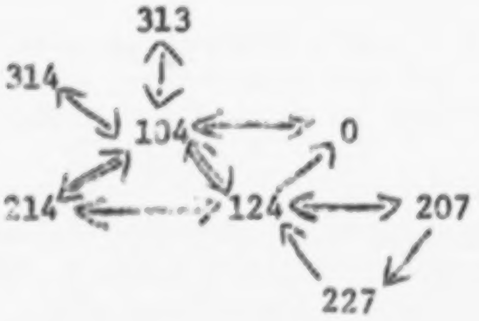
(a) Two similar but distinct sequence structures, one for groups involving a quorum, the other for groups involving only a segment.

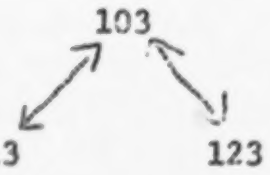
(b) Each structure evidencing sequences between teacher-audience structures and emitter-target-audience structures where the teacher is either the emitter or the target, the other being a single pupil.

(c) The teacher-audience structure also reciprocates with other three-role structures in which teacher is target to a segment emitter.

(d) When the teacher is to enter an audience role, he first identifies a target pupil to be a subsequent emitter; return is to the same condition and may be direct or through a three-role state in which a single pupil emitter and single pupil target interact.

(e) Although the group may terminate from either the teacher-audience state or the teacher emitter, pupil target, audience state; initiation begins with the teacher-audience state only.





(see Figure 8-12)

The above three propositions deal with role allocation and assignment. The major thing to be observed in their juxtaposition is that they are so distinct from one another. Teacher role assignment sequences broke in terms of central group membership versus peripheral membership, non-involved role allocation sequences are more compact but reveal a dependency on teacher membership in the non-involvement role. Role allocation sequences for the central group break in whether the group involves a quorum or not and on relationships between the teacher as an emitter and the pupil as a target. One receives the impression from much educational literature that teacher and pupil roles are timeless generalizations. In our data they appear as complex entities that are related, sequentially to other classroom activity events.

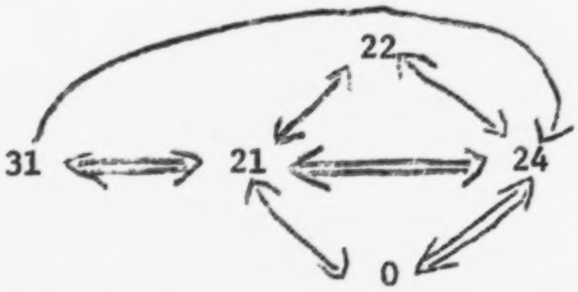
Propositions 8-5. Typical central group functional sequences include: (as illustrated below):

(a) Lessons begin by considering their organization (0→24), then turn to information dissemination about relevant subject matter (24→21).

(b) Incidents of the latter sort are interrupted by excursions into intellectualization (21→31→21) and organization (21→24→21).

(c) Less often, nonrelevant subject matter is taken up (22).

(d) Usually the lesson terminates with an organizational statement (21→24→0 or 31→24→0).



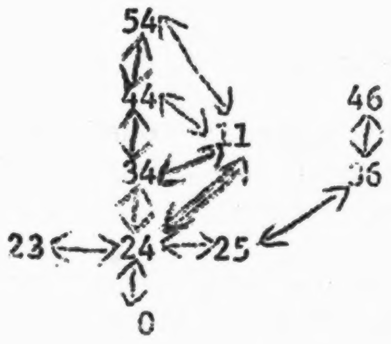
(see Figure 8-4)

Given the relative crudeness of our functional code, it is gratifying to discover that predictable sequences of functional incidents obtain even at this level. However, the functional relationships suggested in Proposition 8-5 are so straightforward as to be nearly obvious. It remains for further analyses (not performed here) to discover sequential relationships between functional and structural events.

Proposition 8-6. Typical teacher location sequences include (as illustrated below):

(a) A vacillation between nearly all locations and a diffuse location (11).

(b) Perambulation up and down the center of the room and between the front-center location (24) and those locations on either side of it.

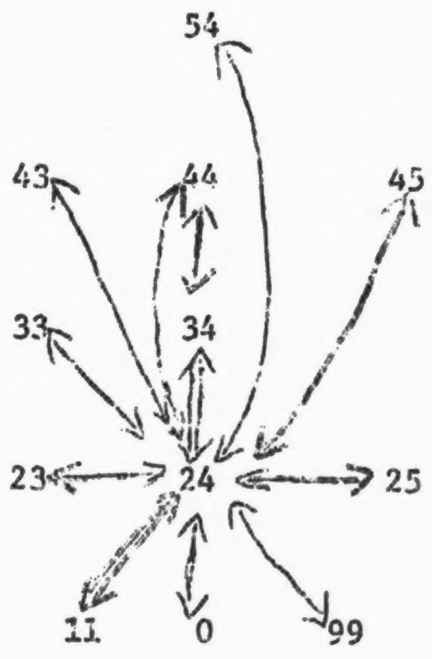


(see Figure 8-28)

Proposition 8-7. Typical central group emitter location sequences include (as illustrated below):

(a) A quick fire back and forth interchange between the front and center location (24) and other locations up and down the center of the room.

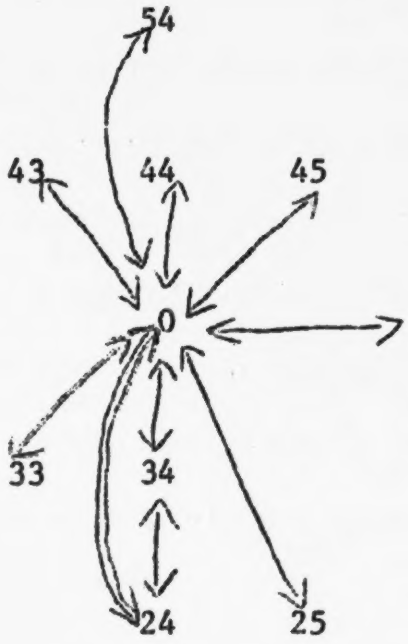
(b) Reciprocation between the front and center location (24) and a diffuse location (11).



(see Figure 8-32)

Proposition 8-8. Typical central group target location sequences include (as illustrated below):

(a) Reciprocation between no target location (0) and other target locations, particularly those up and down the center of the room.



(see Figure 8-36)

The last three propositions brought forth in this section present three, contrasting locational graphs. The first, for teacher location, deals with the perambulations of a distinct human being, and it is not surprising to discover that all locations joined by frequent sequential entrance are in fact adjacent to one another. The figure for Proposition 8-7 shows a dominance of location 24 over all others (suggesting the many times a teacher occupies that role), while in the figure for Proposition 8-8, the dominating location is "0" -- no target location. However, all figures are alike in their emphasis on the significance of the central file down the center of the classroom. Once again we see how very important it is to be in the "action zone" in order to be included within the overt aspects of communication.

Comparisons Among Dependent Variables.

Three gross criteria were advanced in this chapter by which such dependent variables as teacher role assignment, function of the central group, or emitter location in the peripheral group might be compared. They are: persistence -- the degree to which incidents involving categories of that variable tended to persist while other events involving categories from other dependent variable classes changed (measured by K); predictability -- the degree to which a knowledge of antecedent classification of incidents would enable one to improve ones prediction of the subsequent categorization of incidents (measured by Lambda); and reciprocity, -- the degree to which categories within a dependent variable would predict to one another equally. (measured by Chi square with a z transformation).

Figure 8-60 presents a tabulation of values for all classrooms for K, Lambda, and z for each of the dependent variables examined in the chapter. (Data for this table were taken from the top lines of Figures 8-2, 8-6, etc.) One additional column of Figure 8-60 presents the degrees of freedom appearing in the matrices from which these data were drawn.

Turning first to persistence, there is wide variation in the degree to which dependent variable events tend to persist while other activity aspects are changing. Generally speaking, those dependent variables showing the highest persistence are those that measure passivity. Proposition 8-9. Variables showing highest persistence are Non-involved Role Allocation (.792), Non-involved Location (.845), Central Audience Location (.770), and Peripheral Audience Location (.715).

Understandably, since neither members of the audience nor non-involved persons are active participants in acitivities, things tend to happen while they stand by and observe. Conversely, those variables having low persistence scores are those associated with active involvement. Proposition 8-10. Variables showing lowest persistence are Teacher Role Assignment (.409), Central Role Allocation (.426), Central Role Structure (.396), Central Emitter Location (.452), and Central Target Location (.342). Although differences are not large, in both the central and peripheral groups there is also the same rank order among persistence scores for emitter, target (lowest), and audience (highest) locations.

It should be recalled that calculation of predictability scores was made after deletion of the major diagonal of the matrices; that is, after removing from consideration those various episodes upon which persistence scores depended. Thus, there is some tendency for persistence and predictability scores to be negatively correlated. This may be observed particularly in the subset comparisons of Figures 8-2, 8-6, etc. from which the data for Figure 8-60 were drawn; it does not appear particularly in Figure 8-60 itself. However, we have at several points already noted weaknesses of the Lambda statistic. Since it is based on characteristics of the marginal distributions for a matrix, comparisons among matrices whose marginal distributions are somewhat similar are more meaningful than comparisons among highly dissimilar matrices. Why Central Function should generate a Lambda of .214, Central Emitter Location a Lambda of .102, and Central Audience Location of Lambda .859 is not clear, for instance. Although by referring to the matrices from which they were drawn one may easily tease out the reasons for these

Figure 8-60. -- Summary of Sequential Findings For All Classrooms Taken Together

	d.f. in Matrix	Persistence K All Classrooms	Predictability Lambda All Classrooms	Reciprocity z Transformation All Classrooms
Variable Class				
Communication Structure	120	.561	.402	0.30
Teacher Role Assignment	45	.409	.615	-0.96
Non-involved Role Allocation	45	.793	.355	-5.04
Teacher Location	703	.616	.236	-23.50
Non-involved Location	703	.845	.815	-29.78
Central Group---				
Function	91	.696	.214	-3.22
Role Allocation	1081	.426	.310	-25.28
Role Structure	15	.395	.773	-1.18
Emitter Location	703	.452	.102	-20.93
Target Location	703	.342	.354	-22.25
Audience Location	703	.770	.859	-34.41
Peripheral Group---				
Function	91	.572	.785	-8.50
Role Allocation	1081	.517	.592	-37.12
Role Structure	15	.553	.628	-1.24
Emitter Location	703	.552	.169	-25.00
Target Location	703	.534	.164	-26.76
Audience Location	703	.715	.482	-31.15

figures. Regretfully we conclude that comparison among dependent variables for predictability, using Lambda, is not fruitful.

As suggested in the introduction to the chapter, there is also an artifactual relationship involving reciprocity; large, negative values of z can only be generated by matrices with large degrees of freedom. This may readily be seen in Figure 8-60 where all of the matrices whose degrees of freedom exceeded 500 succeeded in generating z scores that were less than -20.00. However, among those matrices with approximately the same degrees of freedom it is quite possible to distinguish variables that generated more or less reciprocity. Two matrices involved 15 degrees of freedom, central and peripheral role structure; but their z scores were nearly identical. Two matrices involved 45 degrees of freedom.

Proposition 8-11. Teacher Role Assignment generates less reciprocity than Non-involved Role Allocation; i.e., Teacher Role Assignment categories were less likely to predict equally to one another in sequences.* Three matrices involved degrees of freedom ranging from 91 to 120.

Proposition 8-12. Communication Structure generates less reciprocity than either Central or Peripheral Function; i.e., Communication Structure categories are less likely to predict equally to one another in sequences.

Proposition 8-13. Central Function generates less reciprocity than Peripheral Function; i.e., Central Function categories are less likely to predict equally to one another in sequences.

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*It is possible to test the difference between two z scores or two Chi square values by means of the F distribution. However, the assumptions involved in such a test are questionable for these data, and no explicit, test of hypotheses 8-11 through 8-15 has been made.

Figure 3-61 -- Statistically Significant Sequential Comparisons For Persistence

						Central Group						Peripheral Group					
	CS.	TRA.	NRA.	TL.	NL.	F.	RA.	RS.	EL.	TaL.	AL.	F.	RA.	RS.	EL.	TaL.	AL.
1st vs. 6th		-	-	-	-		-	-	-	-	-	-					-
6th vs. 11th	+	+	+	+	+		+	+	+	+	+	+					+
1st vs. 11th	+	-	+				-	-			-						
Math vs. SS.		+					+	+	+		+	+		+			+
-30 vs. +40	-	+	-		-	+	+	+	+	+	+	+	+	+	+		+
F vs. M			-		-	+		+	-			+		+			+
M 6th vs. 11th			+	+	+		+	+	+	+							
F 6th vs. 11th		+	+				+	+	+	+	+						
6th M vs. F		-		+	+	-	-	-			-	-	-				-
11th M vs. F	-	+							+					-			-

Note: Entries are signed positively if classrooms exhibiting the first listed independent variable are more persistent, negatively if they are less persistent.

Legend:
CS = Communication Structure
TRA = Teacher Role Assignment
NRA = Non-involved Role Allocation
TL = Teacher Location
NL = Non-involved Location

F = Function
RA = Role Allocation
RS = Role Structure
EL = Emitter Location
TaL = Target Location
AL = Audience Location

Finally, ten matrices had degrees of freedom of either 703 or 1081. For these the following generalization obtains.

Proposition 8-14. Emitter Location generates less reciprocity than Target Location, and Target Location less than Audience Location, for both the central and peripheral groups.

With but one exception, (Audience Location) the following also appears to be true.

Proposition 8-15. Central Group Variables generate less reciprocity than do Peripheral Group Variables. Apart from its basic interpretation within the text, reciprocity here appears to reflect the generative importance of the variable class involved. Those variables that are low on reciprocity -- Communication Structure, Teacher Role Assignment, Central Function, Emitter Location -- have in other chapters been assigned central importance as determinants of classroom activity structure. Evidently they also are characterized by greater asymmetry of their reciprocal sequences.

Independent Variable Comparisons.

Comparisons were made among independent variable sub-sets of classrooms using two, different measures -- persistence (measured by K) and predictability (measured by Lambda). Figure 8-61 presents a summary of significant sub-set comparisons for persistence. Figure 8-62 presents the same information for predictability. As with earlier summary tables, in these a plus sign indicates that classes characterized by the first listed independent variable showed more persistence or predictability than classes characterized by the second listed independent variable.

Grade Level. We turn first to grade level findings.

Proposition 8-16. Sixth grade classes are more sequentially persistent than classes at either the first or eleventh grade levels.

Proposition 8-17. Eleventh grade classes are more sequentially predictable than classes at either the first or sixth grade levels.

These findings are both very clear in the data, although there is one exception to the latter (eleventh grade classes being less sequentially predictable than sixth grade classes for (Communication Structure). We have in earlier sections of the manuscript characterized eleventh grades as being formal. This characterization may now be extended to say that eleventh grade activity characteristics tend to predict one another more than at the other two grade levels. In effect, there is less sequential "error" in classroom activities at the secondary level. Persistence here means that one type of activity characteristic continues on while others are changing -- in effect that one portion of the activity "machine" alters its state independently of others -- and we now discover that this is more likely at the sixth grade level that at either first or eleventh grade. If sixth grade classes are less "traditional," it is also true that portions of their activities change independently of others.

Subject Matter. Nearly as clear findings also obtain for subject matter.

Proposition 8-18. Mathematics classes are more sequentially persistent than social studies classes.

Proposition 8-19. Social studies classes tend to be more sequentially predictable than mathematics classes.

Of these findings, the second is the weaker. Only five variables are involved in the prediction (Teacher Role Assignment, Teacher Location, Role Structure, Peripheral Function, and Peripheral Role Allocation).

The variable demonstrates a reversed finding (Non-involved Location). Evidently, social studies classes evidence more "formalization" of their sequential activities than do mathematics classes. This finding is somewhat at odds with traditional stereotypes of the mathematics presentation being highly structured and ordered, but most of the results observed are for structural components of activities. (Note that there was no difference obtained for central group function). Mathematics classes are clearly characterized by greater persistence of their components, implying a firmer organization of the components of activity systems.

Teacher Age. Oddly enough, teacher age findings were confined primarily to activity components characteristic of the central or peripheral groups.

Proposition 8-20. Younger teachers' classes are more sequentially persistent than older teachers' classes within activity characteristics of the central and peripheral groups.

Proposition 8-21. Older teachers' classes are more sequentially predictable than younger teachers' classes within activity characteristics of the central and peripheral groups.

Actually, findings for activity components that are not associated with groups either are mostly nonexistent (in the case of predictability) or tend towards the disconfirmation of Proposition 8-20 (in the case of persistence). If these propositions are correct, however, it is suggested that whereas older teachers have more formal classroom groups, younger teachers are more able to control portions of group structure while allowing other aspects to change. Apparently these differences in the

Figure 8-62. -- Statistically Significant Sequential Comparisons For Predictability

						Central Group						Peripheral Group					
	CS.	TRA.	NRA.	TL.	NL.	F.	RA.	RS.	EL.	TL.	AL.	F.	RA.	RS.	EL.	TL.	AL.
1st vs. 6th	−						−		+	+	+						+
6th vs. 11th	+		−		−	−	−	−	−	−	−		−	−			+
1st vs. 11th			−		−	−	−	−		−			−				
Math vs. SS.		−		−	+			−				−	−				
-30 vs. +40				−			−	−		−	−	−	−				
F vs. M	−	−			−		−	−			+	−	−		−		
M 6th vs. 11th			−			−		−		−	−	+	+			+	
F 6th vs. 11th	+	−			−		−			−		−	−				
6th M vs. F		+	−		+	−					−	+	+		+	+	
11th M vs. F		−					−			−		−	−				

Note: Entries are signed positively if classrooms exhibiting the first listed independent variable are more predictable, negatively if they are less predictable.

Legend: CS = Communication Structure
TRA = Teacher Role Assignment
NRA = Non-involved Role Assignment
TL = Teacher Location
NL = Non-involved Location

F = Function
RA = Role Allocation
RS = Role Structure
EL = Emitter Location
TL = Target Location
AL = Audience Location

"style" of group control do not extend to sequential characteristics of classroom activity as a whole.

Teacher Sex. As has been the case so often, many findings apparently characteristic of teacher sex in Figures 8-61 and 8-62 turn out to be grade-level artifacts when one examines the evidence of sex comparisons from the sixth and eleventh grades. However, the following findings are retained even after this ammended analysis.

Proposition 8-22. Female teachers' classes are more sequentially persistent than male teachers' classes.

Proposition 8-23. Male teachers' classes are more sequentially predictable than female teachers' classes.

With regard to persistence, Proposition 8-22 holds for Function (for both the Central and Peripheral Groups), Role Structure (for both groups), and Peripheral Group Audience Location. It is contradicted by findings for Non-involved Location and for Central Group Emitter Location. Apparently, women teachers are more likely to exhibit control over portions of classroom activities, although this is not true for emitter location — presumably because of the greater mobility of women teachers. Turning now to predictability, Proposition 8-23 appears to hold for Teacher Role Allocation, Non-involved Location, Peripheral Function (sixth grade only), Peripheral Role Allocation (sixth grade only), and Peripheral Emitter Location. It is contradicted by a finding for Central Group Audience Location. Apparently, men teachers tend towards formalization of activity sequences in the classroom.

Comment. We commented at the end of Chapter VII that the coincidental analysis had generated rather fewer significant findings than we hoped, thus suggesting relative independence of at least functional and structural properties of classroom activities.

Lack of significant findings certainly cannot be said to apply to the sequential analyses presented here in Chapter VIII. In fact, the findings are of sufficient richness as to require considerable study in order to tease out their implications. The "hunch" which suggested that a sequential analysis of classroom activity data would be worthwhile is amply rewarded, and we presume that adequate theories of classroom processes in the future will have to provide empirically-based models for sequential events.

At the same time, the reader is cautioned against the belief that sequential analysis of classroom activities is confined to the strategies exemplified here. As pointed out earlier, these data are based in intra-variable analyses of sequential length ones. We have not presented data bearing on sequential relationships among variable classes, nor have we in fact analyzed sequential events of length greater than one (although Propositions 8-1 through 8-8 "pretend" that such analyses have been performed). It is our hope that others will find the findings of this chapter provocative and will be motivated to the further investigation of sequential events in the classroom and other natural settings.

CHAPTER IX

FINDINGS AND RECOMMENDATIONS

Chapter I stated a series of objectives for the research program with which this report is concerned. They included the development of a system of concepts for analyzing classroom activities, the operationalizing of those concepts in a program of empirical research, and the carrying out of a pilot study in which different types of classrooms were to be examined for similarities and differences in their activity components. Chapters II and III have detailed our attempts to develop a system of concepts for the analysis of activities. Chapter IV reports the methods of our research, the methodology of videotape analysis used, and the coding of classroom records. In Chapters V, VI, VII, and VIII we reported the results of a pilot study in which various independent variables were examined for their effects on classroom activity.

This short chapter has two purposes: to provide a brief overview of findings, and to discuss some of the implications of these results. Since a large number of statistically significant findings were presented in Chapters V through VIII, we begin first with an attempt to summarize some of their more salient features. We then turn to a short interpretation of the significance of the results and suggestions for next steps in the research procedure.

Findings

Summarizing the many findings of Chapter V through VIII completely here, is out of the question. For example, altogether 135 propositions have been stated formally as hypotheses stemming from field study findings. Many of these propositions were of sufficient complexity to require additional textual interpretation when they were originally stated. To repeat them here without that interpretation would be to strip away portions of their interprebility. However, it is possible to examine some of the major tenor of findings for both independent and dependent variable groupings.

Independent Variables

When, then, do we know about those variables that produce differences in class-activities?

Grade Level. Altogether a large number of findings appeared in which the activities of classrooms were found to differ depending on their grade level. Since three separate grade levels were involved within the research design (first, sixth, and eleventh) it would have been predictable that curvilinear grade-level effects would be discovered. However, many of the findings concerning grade level proved to be non-linear. For this reason, it is convenient to summarize results in three separate paragraphs, one for each grade level included.

Altogether, thirteen propositions were stated for first grade classrooms. Classrooms at this level had the greatest rate of activities (5-2)*, were the only classrooms to operate with relevant subject matter (6-1), and most often disseminated information about organizational matters (6-2). First grade classrooms exhibited more peripheral incidents (6-3), more emitter-only central groups (6-4), more emitting by groups of pupils (6-5) who were diffusely located

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*Throughout this section, numbers in parentheses refer to propositions appearing earlier in Chapters V through VIII.

(6-7), showed a greater tendency for emitters to be located at the geographic center of the classroom (6-8), for targets to be diffusely located (6-9), and for fewer front-and-center audiences (6-10). Teachers at the first grade were more likely to be emitters or targets in the central group (6-6) and were also diffusely located (6-11).

As was suggested in Chapter VI, sixth grade classrooms were in many ways more different from the other two grades than were Grade I and Grade XI different from each other. Grade six classrooms exhibited the most information dissemination about sociation (6-12), and the most intellectualization about organization (6-13). They exhibited less centrality of their communication structures (6-14) and more duration of incidents involving peripherality (6-15). Sixth grade classrooms exhibited more audience-only central groups (6-16), fewer role allocations of a traditional nature (6-17), less time during which there was a diffuse audience of pupils (6-22), and more emitting by individual pupils (6-18). More emitters and targets in sixth grade were likely to be located in various, specific locations throughout the classroom (6-20, 6-21). Teachers in the sixth grade were less likely to be emitters or targets in the central group (6-19), located at specific locations around the classroom (6-24), and were more likely to be diffusely located as members of an audience (6-23). Moreover, there was more coincidental predictability at the sixth grade level between: Teacher Role Allocation and Central Function (7-10), Communication Structure and other structural properties (7-19), and Teacher Location and other structural properties (7-20). Teacher Location, however, predicted coincidentally to Central Function least well at the sixth grade level (7-11). Finally, sixth grade classes were the most sequentially persistent (8-16). (Proposition 7-25, which also pertains to sixth grade, is summarized below under Sex of Teacher).

However "different" sixth grade classes may be, eleventh grade classes were the most traditional in our sample. Eleventh grade classes exhibited the lowest activity rate (5-2), the least information dissemination about organization (6-2), the most information dissemination about relevant subject matter (6-25), and the most intellectualization about relevant subject matter (6-26). Interestingly enough, at the eleventh grade level there was more intellectualization about relevant subject matter in Mathematics classes, while at the other two grade levels there was less intellectualization in Mathematics (6-55, 6-56). (The "new mathematics" to the contrary, it was only at the secondary level that mathematics got "interesting" in our sample). Eleventh grade classrooms also exhibited the least residuality in their communication structures (6-27), had incidents of greater duration for emitter role allocation (6-28), and showed less general segmentalization (6-29). Teachers at this grade level were less likely to join pupil groups (6-30) and were more likely to be front-and-center (6-32). Emitters (6-31) also showed similar tendencies. In addition, eleventh grade classrooms were more coincidentally predictable among structural properties generally (7-18). Principally from Teacher Role Assignment to other structural properties (7-21), from Emitter Location to other structural properties (7-22), and from Non-involved Location to Central Function (7-12). They also showed the most sequential predictability among grade levels examined (8-17).

It is not, of course, surprising to find gross differences in activities for the independent variable, grade level. Indeed, should classrooms not differ from one another at these three grade levels, this would be evidence enough to conclude a lack of validity for our methods of measuring activities. What is impressive, however, is the detail provided by the findings. Nearly all of the dependent variables have shown an ability to discriminate classes by grade level, and grades were also shown to be discriminated in terms of their coincidental and sequential activity properties. Together the findings provide an archtypical description of some of the major activity characteristics of these three grades.

Teacher Age. Of the remaining independent variables, the one which generated the most differences was teacher age. In our findings, classes with younger teachers were less likely to make use of the operation function -- particularly operation with (6-33). They also exhibited less information dissemination about relevant subject matter. They were more likely, however, to intellectualize about relevant subject matter (6-37), and were more likely to dissemination information about both non-relevant subject matter (6-35) and sociation (6-36). In terms of communication structure, younger teachers' classes were more central (6-38), less residual (6-39), and more peripheral (6-40). Their classroom groups were more emitter-oriented and less audience-oriented (6-41), had fewer activities involving segments and were more likely to use quorums (6-44). They were also less likely to have front-and-center emitters or targets (6-47, 6-48), and were less likely to have a diffuse audience although the audience was more likely to be front-and-center (6-49). Younger teachers themselves were less often outdies the roles of emitter or target (6-42), were less likely to enter the audience role (6-45), were more likely to have tete-a-tetes with pupils (6-43) and were more likely to be in peripheral groups (6-46). They were also less likely to be located front-and-center (6-50). In addition, younger teachers' classrooms were more coincidentally predictable for both structural-functional relationships (7-14) and structural-structural comparisons (7-24). They were also more sequentially persistent (8-20) and less sequentially predictable (8-21). (Together these last four findings suggest that although younger teachers' classes were more "lively," it was also true that their activity components tended to "fit" one another).

We know of but little educational literature in which the age of the teacher is discussed as a determinant of classroom events, and yet here in these data one meets strong evidence that activities differ depending on teacher age. What are we to make of this information? Three possible explanations suggest themselves. First, it is possible that younger teachers behave in ways that differ from those of older teachers, due to different life experiences, energy quotients, or other personality factors. Second, it is also possible that pupils respond differently to young and old teachers, due to age-relevant stereotypes they carry when they come to the classroom. Finally, it is also possible that our findings reflect a generational difference, rather than one based on age per se, and the fact is that our older teachers were simply trained to teach in ways that differ from those presently being taught. The data presented here are insufficient to disentangle these three possible explanations, but it is clear that for whatever reasons, our older teachers' classes were more organized and "traditional," our younger teachers' classes more integrated, intellectual, and individualized.

Subject Matter. Subject matter produced nearly as many findings as did teacher age. In our data, mathematics classes appeared as *more* likely to yield conditions in which operations with relevant subject matter occurred (6-51). They were *less* likely to exhibit information dissemination about relevant subject matter (6-52). Interestingly, eleventh grade classes used more intellectualization about relevant subject matter for mathematics (6-56), while first and sixth grade mathematics classes showed less intellectualization (6-55). Mathematics classes also showed less information dissemination about non-relevant subject matter (6-53), and less intellectualization about organization (6-57), but (surprisingly) *more* information dissemination about sociation (6-54). Turning to communication structure, we find that mathematics classes showed less centrality (6-58), less residuality (6-59), and less peripherality (6-60)![*] Mathematics classes also had fewer audience-centered central groups (6-61).

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[*] This apparently contradictory result stemmed from the artificial definitions of centrality, residuality, and peripherality. It will be recalled that each of these definitions involved a communication structure that involved the central group; alone (in the case of centrality), with non-involved persons (in the case of residuality), with peripheral groups (in the case of peripherality). The simple fact was that mathematics classes exhibited structures in which the central group itself was less likely -- see Figure 6-2.

Again, the emitter (6-64) and the audience (6-65) were located diffusely in fewer instances in mathematics classes. Mathematics teachers were more likely to be emitters (6-62) and more likely to be involved in peripheral groups (6-63). In addition, mathematics classes were more coincidentally predictable for both structural-functional relationships (7-13) and from communication structure to other structural properties (7-23). They were also more sequentially persistent (8-18) but less sequentially predictable (8-19).

As was true for younger teachers' classes, mathematics lessons in this sample were more integrated, and individualized. They were not, however, more intellectual -- except at the eleventh grade level. Although hortative material abounds in which the "teaching of mathematics" is discussed, studies of the differences in classroom events by subject matter are difficult to find. (Indeed, the only study that comes to mind at the moment is that of Flanders, 1964). Once again, the above results present a variety of archtypical details differentiating mathematics from social studies classes.

Sex of Teacher. The weakest of the independent variables examined for generating activity differences was sex of teacher. In part this is artifactual. As has been pointed out in several places, no male teachers appeared at the first grade level, and it was only possible to establish sex-of-teacher effects at the sixth and eleventh grade levels. It was also true, in addition, that sex-of-teacher findings often exhibited reversals between the sixth and eleventh grades.

The following findings were, however, characteristic of male-female differences and both grade levels. Male teachers exhibited more information dissemination about both relevant subject matter (6-66) and sociation (6-67) and also intellectualized more about organizational matters (6-68). Their classes exhibited more residuality of communication structure (6-69) and more audience-only groups (6-70). Male teachers were themselves more often the emitter, whereas in female teachers' classes pupils were somewhat more often the emitter (6-71). In addition, male teachers' classes demonstrated less coincidental predictability between functional and structural properties (7-15), less sequential persistency (8-22), and more sequential predictability (8-23). An interesting reversal obtains for coincidental predictability among structural variables: at the sixth grade level classes of men teachers exhibited more predictability; at the eleventh grade level, classes of women teachers did so. (7-25).

However, even these findings point out that classrooms with male and female teachers are in fact different from one another. Male teachers' classes exhibit more centralization of classroom operations around the teacher and, as well, more sequential predictability. Once again, it is rare that one finds discussions of the relationships between sex of teacher and classroom processes in the educational literature although many experiments assume a difference.

Dependent Variables

It is also possible to provide summaries of propositions in terms of the major dependent variables used to characterize classroom activities. However, to do this completely would cause us to reproduce and reinterpret the many propositions summarized under independent variable classifications above. Consequently, attention in this section will focus primarily on findings that have not already been discussed.

Communication Structure. Communication structure is the broadest of the structural variables and the only one in which characteristics of all communicating groups are examined together. Generally speaking, we found for communication structure that: most activities are dominated by the central group (5-3), peripheral groups last for but short periods of time (5-6), peripheral groups are more likely to employ intellectualization than is the central group (5-13), and communication structures evidence relatively low reciprocity (8-12). A typical sequence pattern for communication structures is also presented in Proposition 8-1 but is not reproduced here. (The following propositions are also characteristic of communication structure but have already been discussed: 6-3, 6-14, 6-15, 6-27, 6-38, 6-39, 6-40, 6-58, 6-59, 6-60, 6-69, 7-9, 7-19, 7-23.)

Central Function. The dependent variable which generated by far the most findings was central group function. In part this reflected the importance of the functional concepts themselves, but in part the result is artifactual in that whereas there were many structural variables all functional differentiation was piled into a single facet. Generally, the following were found with respect to central function. Two types of functions characterized most activities, information dissemination (5-12) and relevant subject matter (5-14). It was also established that there was remarkably little concern with sociation within any classes (5-14). Finally, organizational incidents tended to be shorter than other types of incidents (5-13). A variety of relationships were also discovered tying some functional conditions with some structural conditions. Three types of function--information dissemination about relevant subject matter, information dissemination about organization and intellectualization about organization -- all predicted to an emitter-audience role allocation (7-1). A lack of function in the central group related to teacher non-involvement or membership in peripheral groups (7-2, 7-3); diffuse teacher location (7-5), and to the presence and diffuseness of non-involved persons (7-6, 7-7). Conversely, generally when central function was codable, teachers were more inclined to be front-and-center (7-4); however, information dissemination about organization was likely to take place from an outskirt location (7-5). One finding relevant to peripheral function should be mentioned; when peripheral function was indeterminant, it was likely that the central group was involved with information dissemination about relevant subject matter (7-8). We have also established that functional sequences show relatively low reciprocity (8-12) -- a typical functional sequence pattern is provided in Proposition 8-5. (The following propositions also involve function but were summarized earlier: 6-1, 6-2, 6-12, 6-13, 6-25, 6-26, 6-33, 6-34, 6-35, 6-36, 6-37, 6-51, 6-52, 6-53, 6-54, 6-55, 6-56, 6-57, 6-66, 6-67, 6-68, 7-10, 7-11, 7-12, 7-13, 7-14, 7-15).

Central Role Allocation. Role allocation deals with the role structure and allocation of individuals to roles of a communicating group. Although a wide variety of findings appeared for this variable, most of them differentiated subsets of classrooms by independent variable, and relatively few role allocation properties appeared for classes as a whole. Among those that did, the following were noted. The predominant role allocation structures were those of emitter-audience and emitter-target-audience (5-10). Role allocations generally show low sequential persistence (8-10). A typical role allocation sequence pattern appears in Proposition 8-4. (Propositions involving role allocation that were summarized earlier include: 6-4, 6-5, 6-6, 6-16, 6-17, 6-18, 6-19, 6-28, 6-29, 6-30, 6-41, 6-42, 6-43, 6-44, 6-45, 6-46, 6-61, 6-62, 6-63, 6-70, 6-71, 7-1, 7-2, 7-3).

Central Role Structure. In general, findings for role structure were less promising than for any of the other dependent variables and tended to parallel those for role allocation. The only unique finding for this variable was that role structures tended to show relatively low persistence (8-10), but generally the gain in analyzing data in terms of this variable did not equal the effort involved.

Central Emitter Location. Each of the locational variables generated a unique pattern of results. Generally it was found that emitters were located up and down the center aisle of the classroom (5-11), that the location of the emitter was a strong coincidental predictor of other structural properties (7-16), that emitter location showed relatively low sequential persistence (8-10) and that emitter location exhibited relatively low sequential reciprocity (8-14). In regard to coincidental predictability, it is interesting to note that predictions from emitter location to other structural properties is strongest at the eleventh grade level (7-22). A typical sequence pattern for emitter location is given in Proposition 8-7. (Other propositions dealing with emitter location not discussed here include: 6-7, 6-8, 6-20, 6-31, 6-47, 6-64).

Central Target Location. Like emitters, targets also tend to be found up and down the center aisle of the classroom (5-11). Target location also shows relatively low sequential persistence (8-10). It is not true, however, that target location predicts strongly to other structural variables, nor are target locations reciprocal. A typical sequence pattern for target location is given in Proposition 8-5. (Additional propositions involving target location summarized elsewhere include: 6-9, 6-21, 6-48).

Central Audience Location. In contrast with emitter and target locations, audiences tend primarily to be located diffusely (5-11), and this pattern has relatively high sequential persistence (8-9). Because of its sequential persistence, no sequence pattern for audience locations was drawn. (Additional propositions involving audience location summarized elsewhere include: 6-10, 6-22, 6-49, 6-65).

Teacher Location. Despite the tendency of emitters and targets to be located up and down the center of the classroom, teachers themselves were more likely to be located across the front of the classroom (5-9). No other general findings appeared for teacher location, and interestingly enough this variable did not appear to be nearly as productive as either emitter location or teacher role allocation. However, a typical sequence pattern for teacher location appears in Proposition 8-6. (Other propositions involving teacher location summarized elsewhere include: 6-11, 6-23, 6-24, 6-32, 6-50, 7-4, 7-5, 7-11, 7-20).

Non-Involved Location. Almost nothing of significance appeared for the variable of non-involved person location. Since there were long periods of time during which no non-involved persons appeared, this variable showed relatively high persistence (8-9). (Additional propositions involving this variable summarized elsewhere appear at: 7-6, 7-7, 7-12).

Teacher Role Assignment. Not surprisingly, considering the centrality of the teacher's role in the classroom, teacher role assignment turned out to be an important and generative variable in the analysis of classroom activities. Teachers tend to dominate classroom activities (5-7), and they are most often found as emitters or targets of the central group (5-8). The variable of teacher role assignment is a strong coincidental predictor of other structural properties (7-17), shows relatively low sequential persistence (8-10), and relatively low sequential reciprocity (8-11). Interestingly eleventh grade classes exhibit more predictability from teacher role assignment to other structural properties than do either first or sixth grade classes (7-21), suggesting that the teacher is more dominant as grade level goes up. A typical sequential pattern for teacher role assignment appears in Proposition 8-2. (Additional propositions involving this variable that are summarized elsewhere include: 6-19, 6-30, 6-42, 6-43, 6-45, 6-46, 6-62, 6-63, 6-71, 7-2, 7-3, 7-10).

Non-Involved Role Allocation. Realistically enough, non-involved role allocation does not produce much of generic interest, although several findings were generated that differentiated classroom subsets. Since on many occasions there were no non-involved persons, this variable generated relatively high sequential persistence (8-9). A typical sequence for non-involved role allocation appears in Proposition 8-3. (Additional propositions involving this variable that are summarized elsewhere are: 7-6, 7-7).

General Findings

Apart from the propositions summarized above, a couple of the propositions stated apply to results in general. It was suggested that the classroom is a generally busy place with rapid shifts in activity components characteristic (5-1). In addition, there was more general variability shown in the type of activity from classroom to classroom than in the overall activity rate (5-4).

It is also appropriate that we summarize here general impressions regarding the types of analyses used with activity data. Generally speaking, the subset comparisons among classrooms using independent variable breaks (Chapter VI) generated a large number of easily interpreble results. In addition to the simple effects of independent variables taken alone, which constituted the bulk of the propositions used to report findings from Chapter VI, a wide variety of complex relationships among independent variables also appear in the tables and text of this chapter. The reader is urged to study these for relationships among the dependent variables taken two or more at a time.

Chapter VII concerned itself with coincidental relationships among activity components. Perhaps the biggest disappointment of the study was the relative paucity of definitive relationships between functional and structural components of classroom activities. We had, frankly, hoped to discover more structural-functional relationships, and their absence suggests that a wide variety of activity "styles" was in fact characteristic of the classrooms sampled. On the other hand, a stronger set of structural-structural relationships was found suggesting that structural components do in fact interpenetrate and determine one another.

Chapter VIII, concerned with sequential relationships among activity components, was not a disappointment. In fact, some of the most striking results came from this chapter, particularly because educational theory has so little information in it pertaining to activity sequences. However, the reader's attention is called, once again, to the fact that the sequential analysis presented in Chapter VIII is but a beginning, and that an adequate understanding of sequential relationships among classroom activities (or other classroom events) awaits the development of additional analytic tools and devices.

Discussion

As part of the epilogue, it is reasonable to ask what has this investigation achieved. In the first place it has delved more deeply than any other study into the character of classroom interaction. In so doing it has demonstrated the viabality of a systematic analytic approach, has shown that the complexity of the classroom phenomenon can be deciphered and has produced findings that promise greater mastery over the educative process. However, it has also raised many questions that in their turn, require further investigation. For instance, a logical extension of the study would lead to a more intricate analysis of classroom behavior at levels less molar than the activity level.

The development of analysis systems at the act level and even at the more molecular linguistic level, are both feasible and desirable. As well, priority should be given to the development of methods suitable for analyzing sequential data.

At the moment there is also a need to acquire data in educational contexts other than typical well-to-do middle class ones. For instance, we predict that the patterns of activities in urban getto schools would be found to be vastly different from those in the schools of our study. Again, atypical classrooms would, we predict, generate distinctively different patterns also. Classrooms with emotionally, orthopedically and mentally handicapped children in them, are likely to have their own discernable character, too. Investigations should also be extended to cover subject-matters other than those conventionally (and conveniently) selected in most studies -- social studies and arithmetic. Art, physical education, nature study, etc., would be sure to provide new insights and extend our conceptual horizons. Prominent among the research priorities, however, should be the longitudinal investigation of classroom behavior. Patently, classrooms develop their own cultures. But the ways they do so are largely unknown. Much educational wastage could be avoided by increasing our understanding of the processes and practices by which teachers go about developing and molding the classroom culture.

Given such extensions of the research and, as well, the development of research strategies and methodologies appropriate for their pursuit, education would then be in a position to make the jump (often too hastily taken) between specific classroom actions and educational outcomes. Clearly, predicting the direct results of specific teaching actions depends on the prior comprehension of the nature of these actions and their relationship with other actions. When this time comes it will be appropriate to undertake the experimental manipulation of classroom conditions. It will be possible to assedd the effects of the use of a new teaching method, the introduction of an inovation, the reorganization of the room, the utilization of multiple teachers or teaching machines and so on. Doing so at the moment, when reliance has to be placed on a very imperfect knowledge of the nature of the teaching situation, is no more than an exercise in pious optimism.

Because effects have always featured prominantly in educational discussion, findings have often come to be equated with effects. To interpret the findings of this current study as effects would be to take an unwarranted liberty. However, in deference to tradition, a brief attempt will be made to talk about some of the educational implications of the study. Necessarily, the discussion represents a venture in conjecture. We would be most unwillingly to claim generalizing power for the data of our pilot study.

It is obvious that the many findings of the study are capable of generating a great deal of discussion. However, only a select few will be dealt with in this final resume.*

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*The interested reader is directed to two forthcoming publications by the authors that will elaborate and expand on the implications of the findings. They are: Diagnosis of Teaching, Holt, Rinehart, and Winston, and Research in Classroom Behavior, A.A.S.A.

The most pervasive finding of the study was one that occasions little surprise, although its implications are religiously and consistently ignored by researchers, theorists and teachers alike -- the classroom is an extremely complicated and busy place. For example, in the least active classroom, a change of one sort or another occurred on the average, once every eighteen seconds. In the most active classroom, there was a change every five seconds. The average number of episodes per class was 373 while the individual totals ranged between 157 and 738. By extrapolation, it follows that some classes are likely to experience 4,500 episodes per school day!

An examination of the functional character of the classroom data reveals that functional changes occur at a more sedate pace. Functional changes happen, on the average, at four second intervals. This means that approximately 75 changes in the content or mode of communication occur in each lesson.

The vast majority of these functional episodes are concerned with information dessinination. Of these, quite a proportion (10% of all time) was devoted to organizational matters -- perhaps thus explaining the smooth organization of the classes. (10% of time adds up to about three and one half weeks in the school year).

All functional roads, however, tend to lead back to information dissemination about relevant subject matter. This suggests that a number of questions might be asked. Is classroom education for the pupil essentially a matter of accumulating information? Obviously advocates of automated teaching think so, obviously the public thinks so, and obviously the classrooms in this study act so. If there is more to education than this, then as far as the current data are concerned it is not noticeably much more. Again in the face of the persistent emphasis on information dissemination,can other educational values play anything but an extremely secondary part. Finally, if teachers are information dissemination agents, do they represent the most efficient kinds of agents? Obviously a teaching machine is going to have difficulty in sympathizing with a troubled child, but perhaps it is a much better medium for presenting information in an ordered and systematic way.

The structural data provide greater detail on the character of interaction. First of all, they show that the prevailing mode of behavior is a public one. Small enclaves emerge in the classrooms but they are typically transitory. Whenever they attract the teacher's participation, action for the majority of the class members is immediately suspended. The relatively simple pattern generated by the role structure sequential data explains the public character of communication. There is a strong and persistent tendency for a structure to emerge that is the existence characterized by an audience.

In the classroom it seems as if there is, in a real sense, a place "where the action is." It is to be found in the centre band which stretches from the centre front of the room to the back. Typically the amount of action diminishes the further away from the front of the room. The emitter and target locations tell the story of the nature of the classroom communication exchange. Essentially it is a back and forth process between action at the front of the room and in the center band action zone. Shakespeare could not have claimed that all the classroom world is a stage, but the data of this study suggest that a bit of it is. Whether the actors are apt for their parts is an issue that might well be studied. Does the dullard make the best foil for the teacher, does the delinquent, does the teacher's pet, does the "bright boy?" Again, if there is an informal staging going on, perhaps formalizing it might be more useful from an outcome point of view. Then perhaps greater attention could be given to kinds of audience involvement that transcend the relatively passive role exemplified in this study. It is not taking a very extreme position to claim that the one characteristic thought desirable of classroom audiences is that they be still. Presumably, on the assumption that if order is maintained, then learning will occur. The reasoning has a certain "excluded middle" quality about it that goes something like this:

If disorder occurs then learning will not.

Therefore, if order occurs then learning will.

The communication structure data suggest that the pervasiveness of the central system merits comment. Presumably, one of the best ways to ensure conformity is to limit the range of counter-conformity experiences available. If children are continuously exposed to an organizational structure that is predicated on an assumption of non-active involvement through passive attention, then presumably, they will become used to, if not actually fond of, this kind of involvement. Psychology has not yet produced either a learning theory or behavioral theory that relies on vicarious experience as its central tenet. Yet vicarious experience is essentially what most children get most of the time. Now either the psychology books will have to be recast or the concommitants of this kind of organizational characteristic of classroom behavior will have to be faced. It would perhaps not be too harsh to suggest that as well as receiving practice in excercising restraint many children are also receiving a thorough grounding in the essentials of apathy.

Consistently, peripheral groups occur relatively infrequently in classrooms and they do not tend to persist unless the teacher is also involved. It is an intriguing thought that after the intimacy of the primary family group and the very limited experiences children have in larger groups, that the school should require them to adjust to the impersonality of the (relatively) huge classroom group.

Under the circumstances then, it might have been anticipated that there would be evidence of a considerable amount of non-involved behavior. There are certain theoretically possible patterns that could have emerged from the non-involved actor identity data. Individual non-involved actors could persist, multiply or be eliminated. They could be many or few. In general, they tend to be few, and they tend to persist. The emergence of many non-involveds seems to coincide with terminating points in the lesson. They presage either the break-down of the system or a restructuring into the ubiquitous central group structure.

It was regretted earlier that strong links between structural and functional properties of the classroom were not found. If, indeed the structural-functional link is tenuous, then there are two basic implications. First, given that the classroom interaction is purposive, the teacher is likely to be trying to have the pupils learn. Presumably then his task is to so structure and manage the environment that learning will in fact occur. It seems reasonable to assume that different kinds of learning occur for different kinds of people under different kinds of circumstances. What the current findings reveal is that whatever kind of learning is envisaged, it is supposed to occur under virtually the same conditions. No matter what is taught, it is often being taught under approximately the same conditions in approximately the same way. This suggests an empirical question -- under what different kinds of structural-functional variations may the education output be varied? Second, if there is uniformity in the way all structural variables associate with all functional variables, and vice versa, it seems reasonable to ask -- "why?" On the assumption that the behavior involved is subject to some control by members in the setting, does it follow that deliberately taken decisions have determined the pattern? Alternatively, have norms of behavior been set up (perhaps over the years) that in their way coerce and constrain individuals into conformity? These two general questions represent another way of asking the basic educational questions: what behaviors are associated with what outcomes and what explains the existing form of behavior?

The grade level differences found convey the reminder that although developmental psychology is well recognized, developmental pedagogy has yet to be acknowledged. Presumably the practices of segregating of children into age defined groups and the logical grading of curricula in terms of difficulty are thought of to be all that is necessary to accomodate the differing needs of growing children. This assumption needs investigation.

The data also showed that in mathematics classes the role of the teacher is more predictable than in social studies classes, and that non-involvement is more predictable in social studies classes. Classes with older teachers, it seems, are substantially more predictable that those with younger teachers, and so are classes with male rather than female teachers. There are implications here that are relevant to the problem of allocating teachers to classes, allocating teachers to subject matter and meeting the needs of different kinds of classes.

In general the independent variable based analyses suggest that much more research attention could be given to each of the independent variables related. By implication there may be other independent variables that also exert an influence on the teaching-learning interaction -- linguistic styles, classroom decor, time of day, temperature are but several that spring to mind.

A discussion of the teacher's role has been left to last because the study was not primarily designed to focus on the teacher. However, the information generated about the teacher was rich and varied.

The findings reinforce the impression that the teacher is constantly, in both senses of the word, central to the functioning of the classroom. If the teacher is absent or non-involved or is a member of a peripheral group, there is likely to be no identifiable function in the central group. Again, if the teacher is emitter in the central group (as he usually is), when the central group is functioning the teacher is likely to be in the center front of the room. When he is moving about the room (which he does infrequently) then no central group function is likely. It also seems as if the members of the class attach ritualistic, formal, educational importance to the teacher's occupancy of the front of the room locations. When he strays from the front, interaction is more likely to be concerned with non-relevant subject matter. Perhaps a clue to the general formalization that characterize the classroom may be gained from one small finding -- when there is a central group in existence then non-involved actors are not likely to be in evidence. It is well known that "loss of control" generally is regarded as undesirable. The indicators of possible loss of control are the emergence of non-involved actors who in their turn generate peripheral splinter groups. What better way then to avoid loss of control than to make use of structures that minimize the likelihood of non-involvement! Consistent with this interpretation is the finding that when there is no central group, the teacher is likely to be diffusely located. Under such circumstances, it seems as if patrol and control are not too disparate. However, while teachers take action to prevent the emergence of non-involved pupils, in some cases, non-involveds are ignored -- perhaps accidentally, perhaps deliberately. Perhaps it is more comfortable to let some "sleeping dogs lie." Perhaps some non-participators represent calculated losses whose non-involvement is the price paid for command over the majority.

There are several clearly marked distinctions between the role of the teacher and the role of the pupils. Not only is the teacher much more directly involved in the action, he is also involved differently. He is emitter nearly as often as are all pupils put together.

He is target far more often than any other individual in the classroom. Furthermore, when he is actively involved in either role, there is a very strong likelihood that he will have an audience and an even stronger possibility that the audience will be a big one. When he is emitter, no matter where he is in the room, he is much more likely to have target. By contrast, a pupil emitter at the front of the room virtually never has a target. If he is anywhere else, his target is almost always the teacher.

The persisting tendency for the teacher to become an emitter points up what is known to anyone who has been to school -- teachers talk a lot. Whether quantity of talk can be equated with quality of talk and how either is related to educational outcomes is a point that would bear investigation.

There are three patterns of locational usage employed by the teachers in this study. They either stayed at the front of the room, ventured up and down the center band or perambulated generally around the room. The consequences of their doing this have been conjectured about earlier. Why they should do it is also worthy of investigation: perhaps such behavior represents the line of least resistance; perhaps it represents a control maintenance mechanism; perhaps these patterned behaviors represent genuine classroom folkways, preserved unwittingly over the centuries, or perhaps such behavior might be explained in role terms as role expectation or anticipation.

Given these facts of classroom life it seems reasonable to conclude that both pupils and the teachers themselves cast the teacher in the roles of "ring-master," "programmer," "prima ballerina." Such a vision does no violence to the common, stereotypic view of the teacher. It also justifies to some extent the conventional forms of teacher evaluation. If the teacher is "ring-master" then he should be evaluated for control. If he is programmer then he should be evaluated for the systematic nature of his teaching. If he is prima donna then he (or rather she) should be evaluated in terms of the reaction of the audience. However, it is not unreasonable to ask what role learning occurs in situations like this. The data of this study do not tell, but they do suggest, that the available model, that of the teacher, has some distinctive characteristics. The model, first of all, is a dominating and controlling one. It is also egocentric in that it demands both the biggest part to play and that everyone should attend to it. It is also a model that characteristically rejects private, intimate interaction in favor of public interaction. Furthermore, the context in which the role is played seems to coerce pupils into conforming to this expectation of public behavior. In this sense the classroom is unique. There is no other situation (with the possible exception of evangelical witness ceremonies) where the persistent reference for individual behavior is an ever present audience. Again the definition of the situation requires a considerable amount of passive involvement for the pupils. The spectator pupils are, supposedly, empathizing with, identifying with, and thinking along with the select cluster of individuals who provide cue-reactions to the teachers' continuing promptings. They learn and experience vicariously. Their involvement is apparently of little consequence either to the teacher, the other class members or themselves.

Along with membership in the classroom goes a great deal of waiting -- and it is subservient waiting. The pleasure of the teacher dictates when involvement, active or passive, may be resumed.

The educational consequences of classroom conditions like these are unknown. They are, nonetheless, testable. But adequate testing depends on setting up counter situations which are thought to be structurally and functionally different. It has already been implied that specific functions might proceed differentially under varying structural conditions. Some things might be undertaken more efficiently in small groups, others by individuals working alone, and others again by large collectivities. If the teacher is to manipulate situations that are other than central group, teacher-emitter-cum target type situations, then obviously he will need management skills that were not required in the classrooms of this sample. If passivity limits learning, then providing for simultaneous activity on the part of a number of actors is necessary. If the domain of non public interpersonal interaction is being neglected, then norms different from these currently being sustained in classrooms will have to be established.

As a final footnote to this discussion there is a point that needs to be made. The educationally-minded reader may find some difficulty in accepting the assurance that by any generally acceptable (intuitive-type) criteria, these classrooms were "good" or "progressive" classrooms. Nonetheless, they were, and what is more they exhibited the moments of humor, sensitivity alertness, rapport, inspiration that characterize the "good" classroom. The empathetic observer would note these and be enthralled by them. But these are highlights. And what is often missed is the recurring persistent background which is more pervasive and eventually perhaps, more powerful. The data of this study tends to remind us of its sobering presence.

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APPENDIX A

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APPENDIX B

SUPPLEMENTARY CODING RULES

Role Allocation

The coding of role allocation is based exclusively on the persistence of a particular set of interactors in either the central or peripheral groups.

1. When and only when a new set of actors (E, T, or A) become involved does the unit change.
2. A change in either the size of the group or a change of particular persons, or both, constitutes the criteria of unitizing.
    a. Changes in the size of the audience for a particular interaction unit--only not those gross changes from the single pupil to the segment (2--75% of p's) to the Quorum class (75% - 100% of p's.)
    b. Changes of target (from individual to individual or from segment to segment) should be recorded as new units.

    Though the code for interaction will be the same, if the teacher merely interacts with another individual or segment, the location of target persons is likely to change, also. Nevertheless, all such identical role actor units should be labeled "T" in the form column.
3. The person (either teacher or pupil) who initiates the interaction unit to be coded should be recorded as the

emitter (column E), and the role reversals with the unit (defined in 2a and 2b) should be ignored, since recording them would falsely indicate a new unit (a change in the set of interactors).

4. The salience of an interaction for the class determines which block of columns are to be utilized for unitizing.

   Any interaction that involves a majority of the class in any of the three roles (emitter, target, audience) is recorded as the central pattern.

   a. The size of the target group does not determine interaction salience, since the entire class audience can attend to a dyadic discussion. When targets are specified (other than the class) the size of the audience determines the salience of that interaction.

   b. The presence or absence of the teacher from some interaction among pupils that has the attention of a majority of the class should be recorded as a central group.

   c. The majority of the class, as well as the other size categories always refers to the total number of persons present in the setting at the time of recording.

5. All interaction salient for less than a majority of the class (involving less than a majority in the three actor roles) is recorded as peripheral interaction. The coding form will permit the recording of only two such peripheral groups at any one time.

a. Coders should ideally choose among existing interaction groups that (1) are most salient or potentially most obvious to other members of the class, and (2) are most readily observable to coders--in that order.

b. Teacher-pupil interaction in peripheral groups (interaction salient for less than a majority) would usually be recorded in peripheral pattern #1, so as to facilitate analysis of pattern sequence and stability.

c. In the event, however, that the teacher interacts sequentially with peripheral groups, and peripheral groups persist as interacting units independently of teacher involvement, the teacher code should shift back and forth between the existing peripheral groups.

d. Since judgements of persistence are necessarily ad hoc, all situations must be observed to persist over time prior to their actual coding. Thus, judgements concerning the persistence of peripheral groups require some pre-coding observation. Such a procedure would also facilitate the choice of which peripheral groups to choose for coding in the event that more than two segments can be observed. The rationale here is simply that potential peripheral salience is likely to be associated with persistence over time.

6. A working assumption of this code is that all interactions directed at a majority or more of the class involves only performer and audience persons as interactors. Hence, only

individuals and segments (< 50%) can be coded as target persons. The convention merely facilitates the recording of unspecified lecture situations, which occur frequently, but will not hinder the systematic differentiation of interaction units.

a. All verbal or gestural emissions that indicate the direction of interaction between two particular interactors or between small interacting groups are recorded in the emitter and target categories except where a majority or more of them are specifically indicated. In the latter event our coding convention requires us to record only the emitter and audience categories.

7. The definition of interaction requires that every performance has a target or an audience that attends the performer, before the act is recorded as an interaction. Hence, an emitter who has no target and no audience is by definition non-involved. Non-involved persons are recorded separately; and only the size, positional make-up, and location of the non-involved persons are coded. Should more than two peripheral groups appear, however, persons in there are handled as if they were non-involved.

   a. By definition, non-involvement refers to activity that is non-communicative or in-activity such as sleeping.

8. The code for interactor categories allows for the inclusion of both teacher and pupils in a single interactor category. The code thus permits the recording of such situations as

pupil (s)' lectures to the class or segment where the teacher shares the role of target or audience person with other pupils.

Role Location

Coding for location is based on the physical placement inter-actors, and changes with (1) the changing direction of interaction between performers, targets, and audience, and (2) the changing location of actors while interaction is ongoing.

Class Grid
(Horizontal)

	5	5	4	3	2	
6	66	65	64	63	62	Back
5	56	55	54	53	52	Rear
4	46	45	44	43	42	Middle
3	36	35	34	33	32	Forward
2	26	25	24	23	22	Front
	Left Side	Left	Center	Right	Right Side	

Figure B.1. -- A calibration for the typical classroom setting.

1. For the horizontal locations within the classroom grid, the right and left areas consist of the two outside columns of desks plus the aisles that separate them from adjacent rows of desks, unless the class is other wise segmented.
    a. In the event that a class in broader (has more rows) than it is deep (number of tiers front to back), then the left and right portions of the classroom grid will be expanded to include one additional row of desks.
2. For the vertical locations within the classroom grid, the forward and middle areas consist of two tiers of desks each; and the rear area shall consist of remaining tiers of desks, unless the class is otherwise segmented.
    a. The convention helps both to standardize distances in front and rear and to describe the class. Where classes are shorter or deeper than six rows, we either expand the middle to include the fifth tier, or expand the rear to include the seventh row. We have no classes deeper than seven rows in the sample.
3. For the horizontal locations within the classroom grid, the middle area is defined so as to include all the rows and tiers of desks not included in the right and left, or forward and rear, areas of the grid, unless the class is otherwise segmented.
    a. The convention, therefore, expands or shrinks the middle area depending on the number of rows of desks.

Since there are no classes in the sample with fewer than four rows of desks, there will always be a center aisle.

4. Segmented classes that separate blocks of pupils into separate locations must be handled individually using the areas described in the grid to the best advantage.

Function

General Rules

1. Never infer the content of speeches you cannot hear.

   Try very hard to hear but do not infer the content of one actor's speeche from the response given by another. This is missing data and must be coded as such in order to reflect the technical problems of our data gathering system.

2. The selection of mode is a forced choice.

   All units must fit one of the three modes.

3. Should two or more modes seem to fit the unit, code for the more sophistocated.

4. A residual category is provided for the selection of content area.

   When the material fits none of the other categories code it as non-relevant.

5. Code only verbal behavior, pay no attention to non-involved persons.

   We have no comparable unit for which to code.

6. Code only for the particular interaction pattern previously coded.

An episode which was previously coded as non-involved behavior cannot now be coded for functional properties.

7. Overcome the tape-slip problem by matching the functional code with the interaction code.

   To fail here would introduce serious bias to our analysis of episode sequence.

Unitizing Rules. The unit used for coding function may be called a thematic episode. The discourse of the classroom may be divided into such episodes by the criteria listed below. Functional episodes tend to have three phases -- opening, sustaining, and terminal. An episode begins with each opening phrase, and our interest is in identification of these phrases. That the episode is abbreviated is of no importance.

1. An episode boundary is established with each opening statement
   - a. An opening sets the topic of the discussion.
   - b. An opening may be a statement, question, answer, or something else. Its importance is that it redirects the discussion.
   - c. An opening may introduce another aspect of the same general topic.
   - d. An opening may represent a shift from generalized discussion of an object or event to the discussion of some specific aspect of the object or event.
   - e. An opening that deals with a topic discussed earlier initiates a new unit, if a codeable unit has intervened.

2. Some conventions will be required to cover the case of abbreviated episodes.
    a. When a pupil-emitted opening is ignored it does not qualify as the start of an interaction pattern in our structural code. Because of general rule #6 it will not be counted as an episode either.
    b. Should the opening be interrupted or closely followed by another opening, not allowing for the sustaining or terminal phases, the opening shall be accepted as a unit.
    c. An abbreviated opening shall not be allowed if the interruption occurs before the topic of the interrupted opening is made clear. Such an event is considered a false start.
    d. In the event of a false start carry over the code of the preceeding unit until you have a recognizable opening or until the structural code indicates that the interaction pattern no longer exist.
    e. It will frequently be the case that an opening statement will be preceeded by a prefatory remark of a transitional nature. Start the unit from the prefatory remark which indicates the pending redirection of topic.

The Communicative Modes

Operation. This mode is defined as any behavioral performance shared by the participants. In this mode people are practicing with symbols. Illustrations, follow:

-group singing

-pledge to the flag

-repeating the Lord's Prayer

-reading in unison

Information dissemination. Included here are all verbalized transmissions of fact, definitions, assertions, etc., purporting to represent facts, objects, or events.

This mode has no truth value. The assertive and informational quality is what we are after here. Also included here are questions of the type that seem to call for answers of this type.

Intellectualization. This mode refers to symbolic meanings that exhibit logical construction - actually particular forms of logical constructions. (It does not follow that, because information units are not of this type, they are either illogical or alogical.)

This mode is considered more sophistocated than either information or experiention. Should it appear with either of these other modes, within a single unit, that unit should be coded as intellectualization.

The following are the forms this mode may take:

1. Conditional inferring - involves presentation of an antecedent from which a consequent can be inferred. The connecting definition, rules, criteria, or observation does not have to have "truth value". "My nose itches, we are going to have company" is acceptable.
    - if you are a Catholic you just cannot accept the idea of birth control.
    - It would be nice if I could give you the problem today, so that those of you who like could study early.

2. Explanation - involves the presentation of a consequent for which an antecedent is to be supplied.

   -Every equasion will have to be checked because you are multiplying in the precess of squaring by something that contains a variable.

   -He would have pushed for a stronger treaty at that time, were it not for the weak position of American shipping in European ports.

3. Comparing-and-contrasting-includes the making of judgements which imply an ability to apply abstract criterion to the objects of comparison, noting either their similarities or differences with regard to the criterion.

   -"How were Jefferson and Hamilton different?" This would be a proper example. Note that the criterion, decentralized vs. highly centralized power in government, is not given in the question.

   -"Which one of these is the larger?" This is not a proper example. Note that the criterion, largeness, is given and calls for a simple information answer.

4. Evaluating and Opining-include those non-logical procedures such as attitude expression, opinion giving, interpretation making, assessing and evaluating.

Content Areas

Subject matter relevant to the general academic prescription. This category denotes discussion that is related to the subject matter being discussed by the class.

1. An inclusive definition should be used as it is not our purpose to dictate what should be discussed. For Example a history lesson can also touch upon geographic, politcal economic, or religious features of the topic, so long as these discussion are related to the topic of the day. In the discussion of an algebra problem, a mechanical error in addition or subtraction is still relevant.
2. One ad hoc judgement is called for in the case where the topic is not clearly related to the subject matter. Otherwise non-relevant discussions should be coded as being relevant if, within the rather immediate context, any actor in the system makes the discussion relevant. What we are getting at here is the problem of rather informal example giving.
    - -One of our teachers speaks of the diversity of opinion within the Communist Bloc and likens it to the variety of opinion within the Christian denominations. There follows a discussion of Baptists vs. Catholic, Friends vs. Methodist, and so on. After a lengthly discussion he says, "So you can see, students.." and then goes on to make the whole issue of variation of opinion within a social movement an example of the case within the Communist Bloc, his topic.
3. While the asking for and giving of answers to specific questions are a part of this content area, discussion of grades, grading procedure, and test are non-relevant.

4. Specific test questions or their answers, as when the teacher reads a list of correct answers for homework or test problems, are intrinsic to the discipline and are therefore relevant.

Organization. Units classified here are those that serve to organize the system as a whole or serve to orient individual actors within the system. Some forms of this are listed with examples:

1. Directing

   -Pass your paper in now.

   -Open your readers to page 328.

   -Take off 10 points for each wrong answer and pass the paper back to the owner.

2. Orienting

   -Who's paper is that?

   -Which problem, John?

   -Sue, is your hand up or not?

3. Sanctions (where we can consider them to have a directing quality about them, not just reward or punishment)

   -Let's all be paying attention now, John.

   -All right, Rudy, let's go.

   Do not count these as management:

   -That's fine, Jean.

   -Good work.

4. Depersonalized directives (these will probably be sanctions too)

   -Wouldn't it be nice if Judy sat straight and tall?

   -I wish Bob was as good a listner as all the rest of you boys and girls are.

Sociation. The focus here is upon the socio-emotional relatedness of actors of the system. The expression of feeling toward other members of ;the system (teacher, other pupils) or significant others related to the system (other teachers, principle) qualify.

1. Statements about likes and dislikes are not sociation unless the object of discussion is another member of the system as defined above. Be warned against jumping to this content area of the first sight of words with "affective" quality but which do not refer to others in the system.
    -I like your answer (it is correct/acceptable).
    -I feel that your position is justified. (the position was stated in the students preceeding answer)
2. Some sanctions may show up here if they are not directive in nature.
    -(Teacher) "Oh John, I am disappointed in you."
3. Personal claims of attachment with, or ownership of, events or objects external to the system are not sociation.
    -My daddy is a policeman.
4. One of the constants of sociation are the ritualistic greetings commonly used. These will be coupled with the operation.
    -How are you?
    -I am fine, thank you.
    -Good morning.

Subject matter non-relevant to the general academic prescription. This category tends to be residual in nature. It is to be considered highly inclusive and all units not coded in the other three content areas are exhausted here.

1. Things like the temperature of the classroom, discussion of grading procedure, the collection of lunch money, where one should wash one's hands, and the discussion stimulated by the T.V. equipment will all end up here.
2. The coder must remember that no matter how far afield the discussion may get it is always possible for the topic to become relevant, rather than non-relevant, if an actor ties in the discussion with the academic topic at hand. As we said earlier, this must be done in the more-or-less immediate context. A reference to a non-relevant discussion of some ten or fifteen minutes earlier does not make the earlier discussion relevant and the code for it should not be altered.

APPENDIX C

RELIABILITY SCORES FOR CODER PAIRS

Figure C.1. -- Inter-coder Reliability
For Communication Structure by Grade Level

Coder Pairs	Grade XI	VI	I
1 and 2	.982	.969	.257
1 and 3	.975	.960	.238
1 and 4	.982	.969	.134
2 and 3	.993	.964	.795
2 and 4	1.000	1.000	.779
3 and 4	.993	.964	.760
Mean	.988	.971	.494

Figure C.2. -- Inter-coder Reliability
For Central Group Function by Grade Level

Coder Pairs	Grade XI	VI	I
1 and 2	.668	.291	.280
1 and 3	.687	.546	.471
1 and 4	.725	.741	.384
2 and 3	.986	.694	.485
2 and 4	.945	.503	.637
3 and 4	.941	.657	.789
Mean	.825	.572	.508

Figure C.3. -- Inter-coder Reliability For Central Group Role Structure by Grade Level

Coder Pairs	Grade XI	 VI	 I
1 and 2	.897	.821	.699
1 and 3	.974	.763	.755
1 and 4	.921	.773	.785
2 and 3	.883	.802	.635
2 and 4	.948	.888	.738
3 and 4	.911	.878	.781
Mean	.922	.821	.732

Figure C.4 -- Inter-coder Reliability For Central Group Role Allocation by Grade Level

Coder Pairs	Grade XI	 VI	 I
1 and 2	.871	.787	.502
1 and 3	.985	.700	.444
1 and 4	.936	.754	.517
2 and 3	.843	.742	.617
2 and 4	.878	.845	.685
3 and 4	.920	.779	.644
Mean	.906	.768	.568

Figure C.5. -- Inter-coder Reliability
For Teacher Role Assignment by Grade Level

		Grade	
Coder Pairs	XI	VI	I
1 and 2	.894	.801	.894
1 and 3	.961	.749	.771
1 and 4	.912	.839	.842
2 and 3	.895	.745	.792
2 and 4	.924	.894	.843
3 and 4	.921	.807	.732
Mean	.918	.806	.812

Figure C.6. -- Inter-coder Reliability
For Teacher Location by Grade Level

		Grade	
Coder Pairs	XI	VI	I
1 and 2	.983	.670	.695
1 and 3	.983	.976	.588
1 and 4	.983	.976	.537
2 and 3	1.000	.713	.714
2 and 4	1.000	.713	.626
3 and 4	1.000	1.000	.698
Mean	.991	.845	.643

Figure C.7. -- Inter-coder Reliability
For Emitter Location by Grade Level

		Grade	
Coder Pairs	XI	VI	I
1 and 2	.913	.705	.644
1 and 3	.974	.717	.613
1 and 4	.935	.760	.528
2 and 3	.909	.639	.623
2 and 4	.927	.739	.641
3 and 4	.927	.696	.782
Mean	.931	.709	.638

Figure C.8. -- Inter-coder Reliability
For Central Group Target Location by Grade Level

		Grade	
Coder Pairs	XI	VI	I
1 and 2	.906	.570	.836
1 and 3	.980	.561	.740
1 and 4	.929	.734	.845
2 and 3	.906	.458	.770
2 and 4	.929	.673	.823
3 and 4	.927	.694	.643
Mean	.930	.615	.776

Figure C.9. -- Inter-coder Reliability For Central Group Audience Location by Grade Level

Coder Pairs	XI	Grade VI	I
1 and 2	1.00	1.00	1.00
1 and 3	1.00	1.00	1.00
1 and 4	1.00	1.00	1.00
2 and 3	1.00	1.00	1.00
2 and 4	1.00	1.00	1.00
3 and 4	1.00	1.00	1.00
Mean	1.00	1.00	1.00

APPENDIX D

THE LAMBDA STATISTIC

The lambda statistic (λ) is presented in Goodman and Kruskal (1954).

Lambda is a non-parametrice statistic, i.e., there are few assumptions made about the characteristics of underlying distribution. Lambda gives the amount of predictive association existing within a cross classification of data. This predictive association equals the proportionate reduction in the probability of error in prediction which results from knowing the classification of an individual or one cross classification dimension as compared to the probability of error in prediction which results from not knowing the classification of an individual or either dimension. Values of lambda range from .00 (no predictive association) to +1.00 (perfect predictive association).

Lambda is assymetric, that is, considering two variables A & B, $(\lambda A>B\#\lambda B>A)$. The predictive increase for Variable B gained by knowing the value of Variable A is not necessarily equal to the predictive increase for Variable B gained by knowing Variable A. Lambda A B is a weighted average of $(\lambda A>B\&\lambda B>A)$ which specifies the predictive increase gained by knowing the value of either A or B predicting to the other.

The data in the present research were arranged in cross classification matrices.

In terms of the frequencies of the 2 sample, predicting from B to A

$$\lambda\ B>A = \frac{\sum_{j} \mathrm{Max}_{k}\ f_{jk} - \mathrm{Max}_{k}\ f_{.k}}{N - \mathrm{Max}_{k.}\ f_{.k.}}$$

where

Max f j k is the cell containing largest frequency observed in row A, and . . .

Max k is the largest marginal frequency among the columns B k and

N is the total number of cases.

This formula estimates

$$\frac{P\ (\text{error} / A\ j\ \text{unknown}) - p\ (\text{error} / A\ j\ \text{known})}{p\ (\text{error} / A\ j\ \text{unknown})}$$

Predicting from A to B, in sample frequencies

$$\lambda\ A>B = \frac{\sum_{k} \mathrm{Max}_{j}\ f_{jk} - \mathrm{Max}_{j}\ f_{j}}{N - \mathrm{Max}_{j}\ f_{j}}$$

where

Max f j k is the cell containing the largest frequency observed in Column B k, and

Max k is the largest marginal frequency among the row A j, and

N is the total number of cases predicting from either A or B to the other, in sample frequencies,

$$\lambda_{AB} = \frac{\sum_j \operatorname{Max}_k f_{jk} + \sum_k \operatorname{Max}_j f_{jk} - \operatorname{Max}_k f_k - \operatorname{Max}_j f_j}{2N - \operatorname{Max}_k f_k - \operatorname{Max}_j f_j}$$

The standard error of lambda may be estimated as

$$\sigma_{\lambda B > A} = \sqrt{\frac{\sum_j \operatorname{Max}_k f_{jk} \; (N - \sum_j \operatorname{Max}_k f_{jk}}{N \; (N - \operatorname{Max}_k f_k)}}$$

To test the hypothesis that lambda equals zero,

$$Z_{\lambda B>A} = \frac{\lambda_{B > A}}{\sigma_{\lambda B > A}}$$

To test the hypothesis that any two lambdas are equal

$$Z = \frac{\lambda_{B>A_1} - \lambda_{B>A_2}}{\sqrt{\sigma^2_{\lambda B>A_1} + \sigma^2_{\lambda B>A_2}}}$$